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EFFECT OF AREA ON AIR POLLUTION CONTROL PROGRAMS

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continued on inside back cover

PB 230 322

Final Progress Report on

EFFECT OF AREA ON AIR POLLUTION CONTROL PROGRAMS

National Air Pollution Control Administration
Grant AP 00458

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211

TABLE OF CONTENTS

	Page
Introduction ----------------------------------	1
Specific Aims ---------------------------------	1
Method of Procedure ---------------------------	2
Significance of the Research ------------------	4
Summary and Conclusions -----------------------	5
Summary of Research Papers --------------------	11

Appendix 1 " An Analysis of the Effect of Social, Economic and Political Factors on State Air Pollution Expenditures"

Appendix 2 " The Socio-Political Characteristics of Urban Governments Engaged in Air Pollution Control Activities"

Appendix 3 " Air Pollution Control in Pennsylvania"

Appendix 4 " State Air Pollution Control Administration in the Commonwealth of Pennsylvania"

Appendix 5 " Cybernetics and Organization Theory: A Quantitative Metric for Information Flows"

Appendix 6 " Allegheny County Air Pollution Program"

Appendix 7 " The Impact of Program Grants on Air Pollution Control in Philadelphia"

Appendix 8 " Lehigh Valley Air Pollution Control District"

Appendix 9 " Politics of Resource Use in Local Government Policy and Programs"

Appendix 10 "Manpower Policies in Slected Air Pollution Control Agencies"

Appendix 11 "Interlocal Governmental Relations in Air Pollution Abatement"

Appendix 12 "On Measuring the Acceptability of the Integration of Local Governments"

FINAL PROGRESS REPORT

EFFECT OF AREA ON AIR POLLUTION CONTROL PROGRAMS

INTRODUCTION

With the support of the research grant AP00458, a number of case studies were concluded on air pollution control programs in Pennsylvania. Some of the work herein is the result of graduate students' thesis research and is so identified within the report. In addition to graduate students, various staff and facilities of the Center for Air Environment Studies of The Pennsylvania State University contributed to the completion of the research.

The best delineation of the research proposed is summarized in the original research proposal which is, in part, reproduced below.

Specific aims

As well as authorizing existing units of government to have programs, federal and state legislation in air pollution control encourages interjurisdictional cooperation or makes possible the creation of a control agency whose area of jurisdiction does not correspond to lines of traditional political subdivisions. The reason is not far to seek: the dynamic meteorological forces reduce the possibility that the area of pollution, the airshed, is completely within the confines of one political unit. The logical step, then, is to create an enforcement unit which contains the whole area polluted.

In the United States there are over 30,000 general-purpose governments, most of which could legally carry on some air pollution enforcement program. These political agencies exist by virtue of enabling legislation in the states where they are located. Most of these numerous local jurisdictions are of diminutive area and are limited in population. They also, of course, have a limited tax base. These facts often lead to the conclusion that an enforcement program is best lodged in a new unit with capabilities for effective air pollution control, rather than using the existing local governments.

Political scientists have long recommended governmental networks which would circumvent the above problems. They have proposed arrangements such as: metropolitan special-districts, annexation by the dominant city, federation of local governments, city-county consolidation, metropolitan councils, interjurisdictional compacts, strong general-purpose counties, and voluntary cooperation. Not all of these have been put forth for air pollution control, but several of them, including the intergovernmental compact and the county unit, often have been suggested. Whatever system is ultimately accepted, however, one thing is clear: the different administrative structures and their operations within the state air pollution control system will have distinctive results for the overall control program.

It is here proposed that two of the most popular areal bases for air pollution control be studied for the purpose of describing and evaluating the effect of specified administrative organization on the control programs. The two are: (1) regional enforcement programs grouping a number of existing political units of government, (2) enforcement areas following the lines of one political unit.

Specific aims of this research, then, are:

1. Describe the administrative sturcture and operating characteristics of the selected units.

2. Evaluate the adequacy of personnel, resources and results of the control agencies.

3. Determine to what extent characteristic operating procedures, problems and program results are related to the peculiarities of the areal organization.

Method of procedure

Pennsylvania presents an ideal setting for the study of governmental administration of air pollution enforcement. Through state legislation a series of regions composed of a large number of counties were set up as the basis of a state enforcement program. As a matter of policy, the two areas with significant existing programs, Philadelphia and Allegheny counties; were allowed virtual autonomy in their control activities, while the powers of other local governments were preserved.

It is proposed that the following kinds of air pollution enforcement agencies be studied: (1) a state region, (2) a county region, (3) an intergovernmental local region, (4) a county unit, and (5) a municipal unit. All of these kinds of jurisdictional areas for air pollution control are extant in Pennsylvania at the present time.

The state air pollution control program is decentralized into seven regional offices. One of these offices would be chosen for the study of the state agency's internal relations with the central office, while another regional office would be examined to determine its routine operating characteristics.

Allegheny county, which has a regional county program will be contrasted to Philadelphia county as a prototype county unit with exclusive jurisdiction within its area of control. The small regional and local programs will be represented by the Lehigh Valley Regional Air Pollution Control Agency and an air pollution agency selected from one of Pennsylvania's medium-sized cities (the final selection to be made after consultation with the state air pollution agency).

The study of each agency will be descriptive in part and will examine the qualifications of personnel and adequacy of budget of each kind of unit. The variety of units chosen will allow comparisons of a regional program based upon a relatively large number of counties, to a regional program based upon one county (Allegheny) and to a regional program based on a few local units (Lehigh Valley). There will also be the opportunity to compare a large state area to a county (Philadelphia) and to a smaller municipal unit of government. Such a mix of units will also provide the information for an evaluation of various sizes of regional programs to different single-unit programs.

Information about the programs will be gathered by a search of the agency files and through interviews. In the regional programs all members of the regional commissions will be interviewed as well as all administrators with supervisory duties. For the study of the state agency the Department of Health's regional supervisor and his personnel engaged in air pollution control work, the state's regional program director and the supervisory personnel of the division of air pollution will be interviewed. In those agencies based upon one unit of government the elected officials responsible for the air pollution control units and all supervisory personnel will be included.

Since it is expected that no air quality survey is available, air sampling will be conducted in the municipality chosen as the example of a local agency as well as in the Lehigh Valley regional area. This study will not be concerned with measuring the overall quality of the ambient air nor in developing sampling techniques or equipment. Suspended particulate matter as measured by Hi-volume sampler and AISI paper tape sampler will be determined in order to show the unit's rank compared to the other agencies. This is the most common symptom by people. It is expected at this time that all of the other agencies included in the study have collected comparable data.

Answers will be sought to this question: How does size of an enforcement area affect an agency program? The question is not viewed narrowly and the following are sub-topics that will be examined: Does the areal size have any effect of the kind of personnel that can be recruited? Does it have any effect on the resources available to be expended? Does it have any relation to the concept of an air shed? Does it have any relation to the mobilization of other forces which affect program needs or ends?

The other basic question to be examined is: How does the kind of enforcement area affect an agency program? Answers to the following sub-questions will give a better indication of the importance of this subject matter. What powers are available to abate air pollution? To what extent does organizational structure affect air pollution enforcement?

The two year program will be broken down in the following periods. The first six to nine months will be devoted to a literature search, the construction of the interview question and pre-testing the questionnaire in areas not included in the final study. The following year will be devoted to gathering data for the six basic studies. During the first year, and partly into the second, the ambient air survey in the two previously identified areas will be performed. During the last three to six months the information will be summarized into a final report

Significance of this research

Review of literature shows that a great many statements are made about what ought to be the proper jurisdictional boundaries for an air pollution control agency. Each areal jurisdiction suggested has its advantages, but it also has its disabilities--these are not often reported. The problem is not limited to air pollution control but is also endemic to political science. Important contributions to knowledge can be made in both areas if a more thorough description and analysis of each kind of areal jurisdiction could be made.

Such information is of vital importance to those concerned with air pollution control. They are interested in vigorous, democratic, and effective programs, yet information necessary to make judg[illegible] is often lacking. Findings about the consequences of jurisdictional area on program results would be of great use to those who must advise federal, state and local legislators, as well as the legislators themselves.

Secondary benefits could accrue from a description of the kinds of problems that result from the division of power between state, local, and regional governments when all are engaged in enforcement programs. Some of these conflicts can be predicted based upon past experience in other enforcement programs. It would be valuable for design of statutes, or in optimizing strategies of enforcement, to know what types of problems are associated with either one or another division of power.

A comparative survey of different areal bases of control agencies can uncover those combinations that work well and those that do not. If the investigation disclosed what factors were important either in strengthening or neutralizing programs, operating guidelines for enforcement agencies could be developed.

SUMMARY AND CONCLUSIONS

An important characteristic of a system of government is that political power may be divided on a territorial basis. An elaborate system was decreed and has evolved in the United States to handle the various kinds of conflicts that arise between residents of the different areas or between officials representing the areas. For the most part, the division of power has been flexible enough to provide governmental services without undue duplication of function.

The territorial base is of great importance in achieving the goals of liberty and welfare in our society. All functions of the public sector are in someway tied to an areal base. Every one of the over 90,000 local units of government (1962) has a precisely defined political area as has the state and the national governments. In like manner functional units of these governments are restricted to a program area that may be larger or smaller than the overall jurisdiction of the parent unit. An example of an exercise of the police power beyond the local jurisdictional boundaries is the power of a gevernment to inspect the milk produced outside of the corporate limits when the milk is to be consumed within the city's boundary. An example of the second case is the restriction of the federal exercise of the police power to federal reserves.

Interjurisdictional problems are by definition not a problem at the core but at the margin-- the territorial boundary. Although there are undoubted advantages to definite and secure territorial boundaries, there are disadvantages. Whenever a boundary is drawn, there invariably comes into being a class who benefit from the existence of the boundary. That benefit may have been the very reason for instituting the boundary in the first instance. It may have been for the provision of common defense, for the provision of a service, or, as has been demonstrated by many, the exclusion of other groups. Those benefiting become the defenders of the existence of the boundary. When a change is proposed, it is how each views the proposed change, and the nature of the individual, that determines the response. It may be that in the absence of knowledge one forsees a personal or group gain or loss; one may accept a personal loss for reasons of equity or may view a change as a personal loss not to be suffered on any account.

Complications arise since there is very rarely any prescience of the consequence of social acts. In any change a number of values may be at stake and it is difficult to determine in advance how such value conflicts are to be resolved.

The problem of this study is less difficult than the one posed in general. Of concern here is: given the American system of government, as exemplified in the Commonwealth of Pennsylvania, what are some of the ways that programs to control air pollution may be organized; and given a number of various sizes and complexity of governmental programs, what is the effect of areal size and areal division of power on the operating characteristics of the program?

Conceptually, the study was organized around case studies of units of various sizes and governmental complexity. The largest agency territorially is a regional area of the state government's air pollution control program. Second in areal size is Allegheny County whose program is in the county health bureau followed in size by Philadelphia City's program, again located in a health department. The next is a regional program now made up of thirteen small local units of government. Last is the program area served by Allentown and Bethlehem's bi-city health bureau.

There were three variables that confound analysis which determined the choice of these agencies. One is territorial size. The range varies from a multi-county area to a single moderately size local government. Another is governmental complexity. The range here is from a multi-powered massive government with jurisdiction over two million persons to one containing less than 100,000 persons. The last is governmental fragmentation. This varies from the state agency with nearly all control powers to Allegheny County's bureau of health which must operate in an area that has over eighty independent municipal governments.

Within the limits of the case study approach, it was the intent to discover the effect of territorial size in reducing the number of interjurisditional problems that may result from the fragmentation of local governments. Contrast of large multi-faceted programs and small multi-powered programs with large single purpose programs and small single purpose programs would allow for a direct comparison of success in overcoming areal problems.

From the research effort a number of conclusions have been reached concerning the current status of interjurisdictional problems in air pollution control. From the number of cases studied it is not possible to determine their generality although some attempt was made to assess the state of programs nationally. Underlined below are the major conclusions drawn from studies summarized in the twelve appendexes at the end of this report. In general, although there existed interjurisdictional air pollution control problems, interjurisdictional problems were not found to be a major concern of the air pollution control programs studied.

There are a number of reasons for this basic conclusion:

1. Structurally, within the organization of the total government, the agencies are too far removed from responsibility for interjurisdictional problems for the administrators to be concerned or to have any impact on the decision making related to this class of problems.

This conclusion is easiest to document. The small regional program operated well because of the direct contact of the chief administrator with the political leadership in each of the cooperating units of government. The state's division of air pollution, although in the huge state bureaucracy, fared well since it was the technical arm of the appointed officials directly responsible for air pollution abatement. From that vantage point, for example, the director of the division of air pollution was also the state's representative to the committee organized to resolve the interstate pollution problem.

The other programs, however, were located at bureau or section levels within large departments in relatively large governments. Their claim for support competed with many others. Even when pressed vigorously, their success was no better than any other small rpogram within a large bureaucracy.

There does not seem to be an easy way out of the dilemma. The underlying reason for their present position reflects, perhaps, the support and commitment of the political level. There are indications that changes can occur as witnessed by the elevation of Philadelphia's program from section to bureau level.

2. As with most air pollution programs in the nation the local programs are hindered in their development by the absence of enabling legislation to promulgate modern air pollution codes.

During the time of the study only the state program and the Lehigh Valley program were operating at levels consistent with their development plans. This is a relative evaluation, for example, since the smaller program's main objective was to reduce dust emissions from the cement industry and was at first little concerned with other aspects of air pollution. The other units were committed to extensive air pollution abatement programs, by choice and the extent of the problem in their area, but were limited to smoke abatement and the use of the nuisance power. Throughout the study period there was virtually no air pollution control program in the bi-city bureau other than incidental to the regular health program.

Philadelphia and Allegheny County programs were at a low ebb of effectiveness due to a variety of reasons. Both suffered from a change of leadership; Philadelphia had an acting head for its program throughout the study period and had serious manpower shortages; Allegheny County, fortunate in locating a competent director from its own ranks, was always well staffed for its functional authority; but the program was extremely deficient in formal control powers and in expenditures for equipment. Both were forcefully pursuing federal grant-in-aid assistance to regenerate their programs. They were eventually successful.

The state program was progessing steadily, although very slowly, in developing multi-dimensional air pollution control program. Its major weaknesses were: the relatively small budget compared to responsibility; a very complex administrative system with a number of built in delays which contributed to a long lag time from complaint initiation to abatement; and, slow development of standards.

The most successful program when relating accomplishments to accepted program goals was in the local government regional agency. Substantial progress was made in limiting the amounts of cement dust emissions throughout the district. This is a limited success because of the narrow objective centered about the reduction of particulates.

The Lehigh Valley program grew during the period of study to encompass, finally, thirteen small governments. Newer areas entering the cooperative program were more urban than the older areas. These newer areas were not as concerned with the dust problem, partly because of the earlier success of the program, but more with problems of odor, open burning, and urban pollution in general. Rather than having to deal with a few polluters, the agency personnel had to cope with many small air pollution problems. At the end of the study period the pressures on the program were getting greater and there is some doubt whether it could operate as effectively as in the past without a reorganization and increased budget.

3. The social environment has been so hostile that the administrators have to devote much of their efforts to maintaining the existence of the agency.

It is a moot point as to whether the social environment is hostile or, for whatever other reason, there is lack of citizen and political support for a program. Positive support for this conclusion rests with the observation that the two best programs had the best political support, by "political" is meant the active and known backing of the politically elected leaders of the government.

4. Organization structure and management practices were often detrimental to vigorous, effective control efforts.

Not unlike other problems, air pollution as an important public policy area burst upon the governments. The agencies that were newly instituted for control had relatively well defined goals, political support and workable structures. Older programs, instituted to fight smoke and dust, were found to be ill prepared to handle modern air pollution. The programs had grown incrementally in the directions of smoke abatement and were not flexible enough in terms of legal authority, budgetary support or orientation to be effective.

For various reasons all programs, to greater or lesser extent, suffered from poor management practices. Records, if kept, were poorly designed to aid management decision making. Much of the information gathered, other than for accountability, was irrelevant and unused. Manpower policies virtually hamstrung the officers responsible for staffing programs. Budget allotments, by almost any criteria, were too low to conduct an effective program. In at least three of the programs studied, major air pollution equipment was acquired only upon the receipt of the monies from federal grant-in-aid programs.

5. Territorially, the problem areas fit the jurisdictional area of the agency, or automatic mechanisms were provided for the resolution of interjurisdictional problems.

Since few of the agencies studied had had the equipment to fully explore their air pollution problem, the extent of the interjurisdictional problem was measured, by them, in terms of the number of complaints that had occurred; or the amount of time devoted to their solution. In the case of Philadelphia, the operating agency officials spent little time on intergovernmental problems although clearly there was a serious interjurisdictional, interstate, problem. Resolution of interareal problems were the responsibility of the political leadership of the city or of the state government. The Lehigh Valley program was organized on the basis of its defined air pollution problem and therefore had very few interjurisdictional problems in relation to its limited dust abatement authority.

The state program was most involved in the problem, perhaps because its jurisdiction was clearer and more encompassing. Among the state regions, interjurisdictional problems were easily resolved because each of the regions were eventually in the same decision structure. Moreover, since the regional engineers were part of the same organization with a high esprit de corps, they were in frequent contact and could concert efforts to abate problems spanning more than one area.

The important state interjurisdictional problems are interstate problems, and it is in this area that most of the energy is expended. With the failure or the proposed Mid-Atlantic States Compact to include Pennsylvania, one could view as wasted the time and effort expended on the interjurisdictional problem. However, the negotiation process has opened lines of communication that may be important in time. Some states may yet be partners, with the federal government, in the development of enforcement programs in the federally designated interstate air shed.

It is noted that three of the programs were organized to reach the interjurisdictional problem by either combining units or by moving the program to a territorially larger unit. The limitations of the existing interjurisdictional devices are well demonstrated by the failure of the Mid-Atlantic States Compact. Unfortunately, the overall state program was not the subject of study and very little more than this can be concluded in the report. The use of contractural agreements are more favorably examined through the study of the Lehigh Valley program.

In any case, it is well known that the problems of air pollution abatement are great within any of the jurisdictions studied. It may be that until programs are developed to a level whereby the agency can cope with the air pollution within its own boundaries, it will not be able to devote a great amount of time or resources to the interjurisdictional problems.

SUMMARY OF RESEARCH PAPERS

The major research efforts are described in the appendixes. It is evident that these are distillations of a great number of documents, reports, data and interviews. A number of them are yet to be completed due to interuptions for military service and other reasons. A short summary of each study follows below.

Appendix 1 "An Analysis of the Effect of Social, Economic and Political Factors on State Air Pollution Expenditure", J. Sacco and E.C. Leduc. A paper delivered at the APCA meeting, June 1968 (submitted for publication).

To determine the effect of the variables on expenditures, indicators of urbanization, air pollution potential, industrialization and personal income were tabulated against air pollution control expenditures.

None of the political variables, except apportionment, were found to be related to expenditures. Social-economic indicators were related to expenditures in 1963 but much less so in 1967. Political theory, emphasizing the impact of economic factors on public policy, were substantiated. It was also concluded that federal involvement since 1963 tended to reduce the differences in program support by the states.

Appendix 2 "The Socio-Political Characteristics of Urban Governments Engaged in Air Pollution Control Activities", E.C. Leduc. A paper delivered at the APCA Conference June 1968. The paper was submitted for publication and accepted for the November, 1968 issue of the Journal of Air Pollution Control Association.

A sample was drawn of all cities with more than 10,000 population in the United States that do not have air pollution control programs. These were compared with cities that have air pollution control programs. The expected relations between industrialization, income, metropolitan site and population were found between the two groups.

Of significance it was found that cities with programs started under the Clean Air Act program grants were different than either of the other two groups. They were not associated with a metropolitan site, had a more professional bureaucracy and were mid-range in population size and in population loss or gain during the last census decade. It was concluded that the federal grants program is generating control activity in areas where none had occurred before.

Appendix 3 "Air Pollution Control In Pennsylvania", E.C. Leduc. A version of a paper published in *The Pennsylvanian* (August, 1968).

The major responsibility for air pollution control varies from state to state. In Pennsylvania the major responsibility for control lies with the state government. The paper outlines the control system in Pennsylvania and assesses its philosophical base. It is stated that even with active state and federal programs there is a role for vigorous local enforcement.

Appendix 4 "State Air Pollution Control Administration in the Commonwealth of Pennsylvania," J. Sacco (unpublished MPA thesis, Graduate School of Public Administration, New York University, 1968), 132 pp.

An intensive study of the air pollution control program in three regions of Pennsylvania's Air Pollution Commission Control program. The relationships among the health department's division of air pollution engineers, the regional association members and the air pollution commission are examied. The abatement process is fully explicated and lag times from complaint initiation and case abatement are estimated. The effect of federal program grants and changes in operating procedures are examined.

Appendix 5 "Cybernetics and Organization Theory: A Quantitative Metric for Information Flows", B. Clemson (unpublished M.A. thesis, Department of Political Science, The Pennsylvania State University, 1967), 117 pp. Research supported by training grant #AP00002 and research grant AP00458.

Cybernetic and information theory are used to develop a metric to measure information in an air pollution message. The basic relation used is that where the bits of information are said to follow

$$I = -\log P(E)$$

where I is the amount of bits of information and P(E) is the probability of the event E. Information sets are established for a wide assortment of air pollution information bits. A system of measurement based on the Allentown-Bethlehem Bi-City Health Bureau is used as an example.

Appendix 6 "Allegheny County Air Pollution Program", R. Kistler M.P.A. internship paper report.

Allegheny County's air pollution control program has received nationwide attention for the dramatic reduction of smoke emissions during the decade 1950-1960. More recently, newer air pollution problems have resulted that have increased organizational stress. The paper examines the important characteristics of the Allegheny County program and assesses the response of the organization to the federal program grant requirements.

Appendix 7 "The Impact of Program Grants of Air Pollution Control in Philadelphia," D. DeWald. (M.A. thesis interrupted by military service, Department of Political Science, The Pennsylvania State University). The research reported here was supported by AP00458 and funds from training grant AP0002.

A study was initiated to estimate the effect of a federal program grant on a local air pollution control program. Earlier studies had posited that federal grants distorted local government. After detailed analysis of personnel practices, equipment purchases, fiscal management and program activities; the federal program grant seemed to have little distorting effect in local decision making. Some minor administrative inconveniences relating to bookkeeping procedures were noted, but were considered unimportant. The main effect was the doubling of program activity. Overall, few of the negative effects mentioned in earlier sutdies were found.

Appendix 8 "Lehigh Valley Air Pollution Control District," S. Baccanari M.A. master's essay report.

A number of factors are important in successful intergovernmental relations including mutual trust and the determination of a viable organizational structure. A study was completed of an air pollution control program using the device of parallel action. In the Lehigh Valley Air Pollution Control program each of the small cooperating governments passed similar control ordinances and hired the same administrator. Although technically there is no overall joint authority to control air pollution, the method effectively coordinated the reduction of dust and smoke throughout the area. There is some doubt to whether the method could be successful in more urban areas with more complex problems.

Still to be completed is an analysis of a survey questionnaire assessing the response of citizens to interjurisdictional agreements.

Appendix 9 "Politics of Resource Use In Local Government Policy and Programs", E.C. Leduc. Paper delivered at the *Third Northeast Seminar on Natural Resource Use* (November, 1967); it is to be published in the forthcoming *Proceedings*.

An evaluation of some aspects of the political process on the use and misuse of natural resources is conducted. Of special interest are capital improvements budgeting and the planning process for the control of resource use.

Summary of studies show that these processes have not been adequately used. It is concluded that greater gains are to be derived from full participation in the political process to attain desired ends. Isolation from politics tends to result in the non-implementation of desired policy.

Appendix 10 "Manpower Policies in Selected Air Pollution Control Agencies," E.C. Leduc, I. Gartner, J. Sacco and R. Kistler, *J. Air Poll. Control Association*, 18 (April 1968), pp. 211-214. From a paper delivered at the APCA Conference June, 1967.

The efficiency of governmental air pollution control agencies are affected by many external and internal processes. The administrative practices surrounding the acquiring and retention of qualified personnel in air pollution control agencies was greatly affected by the overall administrative system. In particular, testing procedures, residence requirements and pay plans were found to be important factors in the agencies studied.

Appendix 11 "Interlocal Governmental Relations in Air Pollution Abatement," S. Baccanari and E.C. Leduc. Paper delivered at the APCA meeting June 1968 (submitted for publication).

A survey of organizational arrangements to integrate governmental activities at the local level. Short definitions of the various methods observed by others are given.

Studies are reported of two different instances of local programs using the idea of parallel action. In one area the jurisdictional area of program activity was coordinated by having each of the thirteen separate jurisdictions hire the same officer and adopting similar ordinances. In the other area a formal board was organized to administer the overall area; however, each separate jurisdiction adopted its own ordinance.

Appendix 12 "On Measuring The Acceptability of the Integration of Local Governments," E.C. Leduc (paper in preparation for publication)

Based on a model proposed by Kemeny and Snell in Mathematical Models for the Social Sciences, a series of questions pairing methods of interlocal relation was used in a local opinion survey. The model reproduces the series of questions as an attitude matrix. This procedure allows for a solution of a matrix B, the median attitude set of the population. Attitude matrices for each of the sub-areas are constructed and compared. It is shown that the amount of disagreement about the procedures leads to the acceptance of those methods that do not require changes in the structural organization of the governments.

AN ANALYSIS OF THE EFFECT OF SOCIAL, ECONOMIC AND POLITICAL FACTORS ON STATE AIR POLLUTION EXPENDITURES

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Introduction.--Among the fifty states considerable variation occurs in air pollution policies. The level of expenditures, the type of activities, and nature of the programs all vary. The purpose of this paper is to analyze the extent to which expenditure variations are due to economic, social, and political factors.

Literature Review.--Although no previous effort has been specifically directed toward analyzing the differences in state air pollution policy outcomes, other policy areas have been studied. These include: education, health, welfare, highways, public safety, and conservation. Generally the studies have attempted to explain policy variation in terms of prevailing economic, social, and political conditions.

Most of the research points to social-economic factors, not political factors, as the cause of variation in policy. According to this research, both the political system of a state and the policies are a function of the level of economic development of that state.[1] The effect of economic development is, of course, variable. In some policy areas, economic development is a more important determinant than in others. For example, in areas where the federal government participates, the effect of economic conditions may be mediated by federal grants.[2]

Thomas Dye in a recent study found that per capita expenditures, one important policy outcome, are related to indices of economic development. For example, educational per capita expenditures are related to income and education; health expenditures are related to urbanization; and highway expenditures are related negatively to industrialization and positively to Republican state control.[3]

For the most part, Dye's findings and those of other researchers coincide. In regard to education policy R. Salisbury[4], S. Fabricant[5], and S. Shapiro[6] all find that economic development, particularly income, is the chief determinant in education outcomes. In the area of welfare policy, Dawson and Robinson[7] find that economic development and to some extent federal aid are important in shaping welfare policy. R. Friedman[8] finds that ruralness, federal aid, and Republican control are the principal factors in highway policy.

Complete research on policy outcomes in states provides two elements of interest for the present study of air pollution policy. First, it suggests the variable to use: social, economic, and political. Second, it suggests the direction and importance of these variables vis-a-vis policy. Economic development is the important determinant but may be affected by federal aid, decentralization or partisanship.

Methodology.--The research model depicts the air pollution problem as a system of interacting variables. The system includes: the social-economic factors, the political factors, and the policy outcomes. The policy outcomes are essentially the result of interplay of the economic and political factors. Given this model, the questions are: (1) how should these variables be quantified and, (2) what techniques should be used to determine the importance of each variable?

Social-economic conditions are characterized by levels of urbanization, industrialization, and income. These levels will be measured or inferred in this paper by the following indicators. Urbanization is measured by the percentage of the state's population living in places above 2500 persons or in the urban fringe of cities of 50,000 or more.[9] Industrialization, the second indicator of economic development, is taken from Dye's work and is measured by "one minus the percentage of work force engaged in agriculture, fisheries, and forestry."[10] Income is simply measured by the median personal income.[11]

The number of employees in selected industries is used as an indicator of industrial air pollution potention. The industries used to calculate this estimate of pollution potential are: bituminous coal and lignite mining; paper and allied products; chemical and allied products; petroleum and coal products; stone, clay, and glass products; primary metals, and electric, gas, and sanitary services.[12]

Characteristics of the political system include: partisanship, interparty competition, malapportionment, voter participation, local control effort and total government expenditures. In several cases, more than one measure exists for each of these factors. Those selected are the ones particularly pertaining to state government.

One index was employed to measure both partisanship and interparty competition. This index is derived by "tabulating the percentage of two-party popular vote for the governor received by each party in each election [1946-1963], and the percentage of seats in each house of the legislature held by each party in legislative session."[13] The measure of malapportionment from Schubert and Press is a statistical comparison of the numeric population in each election district and the number of state representatives from that district.[14] For a measure of voter participation, the average percentage of eligible voters casting votes in the gubernatorial elections between 1954 and 1964 is used.[15] Local control effort is measured by the percent of population covered by full-time local programs. The last indicator, total state governmental expenditure, is the total amount of money spent by each state government expressed in per capita figures.[16]

The level of state air pollution control activity, the target of this paper, is measured by total state air pollution expenditures. The information is taken from the Air Quality Hearings of 1967.[17] Expenditures are, of course, a rough measure of policy. The richness of policy outcomes may not be fully expressed by expenditure figures; nevertheless, spending does provide a rough guide to differential effort.

Analytical Techniques.--The social-economic and the political variables are the independent variables while the expenditures are the dependent ones. For the purposes of analysis, each of the independent variables is cross tabulated with the dependent variable. The tables resulting from the cross tabulation are then tested with the chi square statistic and simple percentages to locate the important variables. For the independent variables (e.g., urbanization, industrialization, malapportionment, etc.) the cutting point is derived by calculating the mean (except for personal income) for each variable and then dichotomizing about the mean.

Expenditure, the dependent variable is classified in two ways. First, it is divided on the basis of states expending and not expending. Then it is divided by levels of expenditures: no expenditures, expenditures falling below the average, and expenditures above the average.

Findings.--In 1963 thirty-five state governments did not expend for air pollution; fourteen states did while no information was available for one state . Of the fourteen states spending, seven spent below the average, 0.6 cents per capita, and the seven spent above the average. The range of expenditures was from .04 to 6.0 cents per capita. The analysis of the state expenditure patterns reveals that all four measures of social-economic development; urbanization; industrial air pollution potential; industrialization; and personal income were related to per capita air pollution expenditures. Among the political variables, on the other hand, only apportionment was related to expenditure outcomes.

Table 1.--High and Low Urbanized States and State Air Pollution Expenditures, 1963.

State Air Pollution Expenditures, 1963	Urbanization[a]				
	Less than 70%		70% and Higher		Total
	N	%	N	%	
None	26	83.9%	9	50.0%	35
Below the Average (.09 - .60)	3	9.7	4	22.2	7
Above the Average (.61 - and greater	2	6.4	5	27.8	7
Total	31	100.0	18	100.0	49

[a]Range: 32.5% to 88.6%

For the comparison of no expenditures and expenditures $x^2 = 6.40$ $p < .02$
For the comparison of levels of expenditures $x^2 = 6.70$ $p < .05$

Urbanization is related to expenditure in both comparisons (Table 1); the first is between states expending and not expending and the second is between levels of expenditures. Fifty percent of the states in the highly urbanized category expended, compared to 16.1% in the less urbanized states. In the expenditure group above the average, 27.8% of the highly urbanized states were active compared to 6.4% in the less urbanized states.

There is considerable difference between states in the high and low categories of industrial air pollution potential and their expenditure behavior (Table 2). Eighty-two percent of the states in the high pollution categories expend compared to 13.2% in the low categories.

Table 2.--Number of Employees in Air Pollution Potential Industries and State Air Pollution Expenditures, 1963.

State Air Pollution Expenditures, 1963	Number of Employees in Air Pollution Potential Industries[a]				
	Less than 91,000 N	%	91,000 and over N	%	Total
None	33	86.8%	2	18.2%	35
Below the Average (.09 - .60)	3	7.9	4	36.4	7
Above the Average (.61 - and greater)	2	5.3	5	45.4	7
Total	38	100.0	11	100.0	49

[a] Range: 1794 to 494,877

For the comparison of no expenditures and expenditures $X^2 = 19.7$ $p<.001$
For the comparison of the levels of expenditures $X^2 = 20.1$ $p<.001$

Those states spending above average are predominately (45.4% compared to 5.3%) from the high air pollution potential categories. Of course, two states in the low air pollution category expend above the average. This discrepency suggests the influence of other variables, or the fact that this indicator is concerned solely with industrial pollution.

Table 3.--Degree of Industrialization in the States and State Air Pollution Expenditures, 1963.

State Air Pollution Expenditures (¢ per capita)	Degree of Industrialization[a]				
	Less than 90% N	%	90% and Greater N	%	Total
None	20	91.0%	15	55.5%	35
Below the Average (.09 - .60)	1	4.5	6	22.2	7
Above the Average (.61 - and greater)	1	4.5	6	22.2	7
Total	22	100.0	27	99.9[b]	49

[a] Range: 63.1% to 98.5%
[b] Not 100% because of rounding error

For the comparison of no expenditures and expenditures $X^2 = 7.42$ $p<.01$
For the comparison of the levels of expenditures $X^2 = 7.42$ $p<.05$

As other indicators of economic development, degree of industrialization differentiates significantly between states expending and not expending and between the levels of expenditure (Table 3). In fact, only two of the fourteen states expending fall in the lower industrial categories.

Table 4.--Median Personal Income for the States and State Air Pollution Expenditures, 1963.

State Air Pollution Expenditures, 1963 (¢ per capita)	Median Personal Income[a] Less than $2,940 N	%	$2,940 and Greater N	%	Total
None	28	84.8%	7	43.7%	35
Below the Average (.09 - .60)	3	9.1	4	25.0	7
Above the Average (.61 - and greater)	2	6.1	5	31.3	7
Total	33	100.0	16	100.0	49

[a] Range: $1,751 to $3,678

For the comparison of no expenditure and expenditure $X^2 = 4.06$ $p<.05$

For the comparison of levels of expenditure $X^2 = 4.35$ $p<.10$

Unlike the other measures of economic conditions, median personal income significantly differentiates only between those states expending and not expending. There is a percentage difference between levels of spending and personal income but apparently not large enough to be statistically significant.

In contrast to the social economic variables only one of the political variables, malapportionment, shows a significant relationship to expenditure outcomes. In the case of malapportionment, the relation appears between the levels of expenditures and not between spending and no spending.

Table 5.--Malapportionment in the States and State Air Pollution Expenditures, 1963.

State Air Pollution Expenditures, 1963 (¢ per capita)	Malapportionment				
	High		Low		Total
	N	%	N	%	N
None	19	79.2%	16	64.0%	35
Below the Average (.09 - .60)	4	16.6	3	12.0	7
Above the Average (.61 - and greater)	1	4.2	6	24.0	7
Total	24	100.0	25	100.0	49

For the comparison of no expenditures and expenditures $X^2 = 1.38$
For the comparison of the levels of expenditures $X^2 = 8.82$ $p<.02$

In 1963 air pollution expenditures at the state level were related to economic conditions as measured by urbanization, industrial air pollution potential, degree of industrialization and median personal income. Malapportionment was the only political variable related to expenditures and then only to level of expenditures.

Several changes have taken place since 1963. The connection that existed between economic factors and spending behavior in 1963 is weaker; states at all stages of economic development are financially participating in air pollution control. A difference, but not a statistically significant one, continues to exist in the levels of expenditure, with the economically advanced states spending more than the less economically advanced states.

Table 6.--High and Low Urbanized States and State Air Pollution Expenditures, 1967.

State Air Pollution Expenditures, 1967 (¢ per capita)	Urbanization				
	Less than 70%		70% and Greater		Total
	N	%	N	%	
None	13	40.6%	2	11.1%	15
Below the Average (.09 - 4.0)	14	43.8	10	55.6	24
Above the Average (4.1 - and greater)	5	15.6	6	33.3	11
Total	32	100.0	18	100.0	50

For the comparison of no expenditures and expenditures $X^2 = 5.19$ $p<.02$
For the comparison of the levels of expenditure $X^2 = 4.77$

Urbanization differentiated between states spending and states not spending, but not between levels of expenditures. Since both expenditure comparisons were differentiated by urbanization in 1963, changes must have occurred in the expenditure patterns. A comparison of the expenditure pattern for the urban states in 1963 and 1967 casts light on the nature and degree of change.

Table 7.--Comparison of Expenditure Patterns in High and Low Urban States in 1963 and 1967.

Year	% Spending			% Spending Above Average		
	High Urban	Low Urban	Difference	High Urban	Low Urban	Difference
1963	50.0%	16.1%	44.9%	27.8%	6.4%	21.4%
1967	88.9	59.4	29.5	33.3	15.6	17.7
Change in Points	+38.9%	+43.3%	-15.4%	+5.5%	+9.2%	-1.2%

The more pronounced changes have occurred in the broad division, states spending and not spending. In 1967 a greater percent of states in both the high and low urban category (38.9 and 43.3 respectively) expended. The difference between the high and low urban categories in 1967 was somewhat less (15.4 percentage points) than in 1963. However, a difference of 29.5 percentage points still exists. Less change has occurred in the level of expenditures. The increase in percentage of states spending above average is slight, and the gap between the high and low urban states has remained about the same 21.4 percentage points in 1963 and 17.7 percentage points in 1967.

Since the numerical expenditure categories in 1963 and 1967 are different, the validity of such a comparison may be questioned. The rational justifying the comparison lies in the fact that in both years similar criteria was applied to derive the expenditure categories. For each year the expenditures were divided on the basis of no expenditures, expenditures at or below average of all the states, and expenditures above the average for all states.

Table 8.--Number of Employees in Industrial Air Pollution Potential Establishments and State Air Pollution Expenditures, 1967.

State Pollution Expenditures, 1967 (¢ per capita)	Number of Employees in Industrial Air Pollution Potential Establishments				
	Less than 91,000		91,000 and Greater		
	N	%	N	%	Total
None	13	37.1%	2	13.3%	15
Below the Average (.09 - 4.0)	15	42.9	9	60.0	24
Above the Average (4.1 - and greater)	7	20.0	4	26.7	11
Total	35	100.0	15	100.0	50

For the comparison of states spending and not expending $X^2 = 1.87$
For the comparison of levels of expenditures $X^2 = 2.83$

With regard to industrial air pollution potential, the finding is the reverse of the results in 1963 when pollution potential did appear to relate to expenditures. An investigation of the change occurring are explored in Table 9.

Table 9.--Comparison of the Expenditure Patterns of High and Low Industrial Pollution Potential States, 1963 and 1967.

Year	% Spending			% Spending Above Average		
	High	Low	Difference	High	Low	Difference
1963	81.8%	13.2%	68.6%	45.4%	5.3%	40.1%
1967	86.7	62.0	23.8	26.7	20.0	6.7
Change in % points	+4.9%	+49.7%	-44.8%	-19.7%	+14.7%	-35.4%

When the states are dichotomized along the lines of spending and not spending, a substantial increase is seen in the percent spending for the low air pollution categories. In addition, the gap between the high and low pollution potential states in 1967 is considerably narrower than it was in 1963, a difference of 23.5 percentage points compared to 68.6 percentage points in 1963. The percent of states in high level spending, on the other hand, show a reverse pattern. In the high pollution potential category, fewer states are expending in 1967 than in 1963 and the low potential category more states are expending in 1967 than in 1963.

Table 10.--Degree of Industrialization and State Air Pollution Expenditures, 1967.

State Air Pollution Expenditures, 1967 (¢ per capita)	Degree of Industrialization				
	Less than 90%		90% and Greater		
	N	%	N	%	Total
None	10	45.5%	5	17.8%	15
Below the Average (.09 - 4.0)	9	40.9	15	53.6	24
Above the Average (4.0 - and greater)	3	13.6	8	28.6	11
Total	22	100.0	28	100.0	50

For the comparison of the states expending and not expending $X^2 = 4.46$ $p<.05$
For the comparison of the levels of expenditures $X^2 = 4.78$

Industrialization, like urbanization, distinguishes between state spending and not spending, but not between levels of expenditure. In 1963 industrialization was related to both expenditure comparisons. Some shift in expenditure behavior has apparently occurred. Table 11 explores these shifts.

Table 11.--Comparison of Expenditure Patterns of High and Low Industrialized States for 1963 and 1967

Year	% States Spending			% States Spending Above Average		
	High	Low	Difference	High	Low	Difference
1963	44.4%	9.0%	35.4%	22.2%	4.5%	17.7%
1967	72.2	54.5	17.7	28.6	13.6	15.0
Change in % Points	+27.8%	+45.5%	-17.7%	5.6%	9.1%	-2.7%

More states in the high and low industrial groups were expending in 1967 than in 1963. However, the gap between the high and low industrial groups as in the case of high and low urbanization has not decreased considerably reflecting the continued propensity of industrialization to differentiate between those states spending and not spending. In the category of above average expenditures, both the high and low industrialized states have shown a slight increase.

Table 12.--Malapportionment in the States and State Air Pollution Control Expenditures, 1967

State Air Pollution Expenditures, 1967 (¢ per capita)	Malapportionment				
	High		Low		Total
	N	%	N	%	N
None	6	30.0%	9	30.0%	15
Below the Average (.09 - 4.0)	10	50.0	14	46.7	24
Above the Average (4.1 - and greater)	4	20.0	7	23.3	11
Total	20	100.0%	30	100.0	50

For the comparison of no expenditures and expenditures $X^2 = .000$
For the comparison of levels of expenditures $X^2 = .088$

Malapportionment, the only political variable related to air pollution expenditures in 1963, revealed no relationship in 1967. In both categories, high and low malapportioned, seventy percent of the states expended.

Table 13.--Comparison of Expenditure Patterns in High and Low Malapportioned States for 1963 and 1967

Year	% States Spending			% States Spending Above Average		
	High	Low	Difference	High	Low	Difference
1963	36.0%	20.8%	15.2%	24.0%	4.2%	19.8%
1967	70.0	70.0	0.0	23.3	20.0	3.3
Change in % point	+36.0%	+49.2%	-15.2%	-0.7%	+15.8%	-16.5%

In both expenditure categories, percent spending and percent spending above the average, the gap between well and poorly apportioned states has diminished.

Discussion.--In 1963 fourteen states expending for air pollution were characterized by a high degree of economic development. These states were facing severe pollution problems but possessed enough resources to devote some to air pollution control. Without this combination of a severe problem and sufficient resources other states did not expend for air pollution.

Expenditures were only related to one political variable, malapportionment. Although this does not eliminate the political factors, the findings do suggest that several of the political factors considered to be important are overshadowed or limited by economic conditions. The political variable, of course, may be more subtle than the indicators were able to explore or political influence may lie in outcomes characteristics not analyzed in this study.

The reason for the pattern of expenditures lies partly in the history and philosophy of the attack on air pollution and partly in the limitation of the state governments. Historically, air pollution was considered a problem of the cities, particularly the large ones. For the most part the pollution problem did lie primarily within the boundaries of the city. Consequently, the states did not receive demands to take part in air pollution control until 1950. In addition, the state governments were generally not concerned with urban problems;

they were rurally dominated, not geared financially or administratively to handle urban problems.[18]

After 1950 the situation changed; events tended to make the states concerned with air pollution control. But again, the historical fact of local control and especially the limitation of the state governments' financial and administrative structure prevented only but the most severely polluted or most able to respond.

By 1963 tremendous pressure mounted for extra-local effort. The air pollution problem, because of increased urbanization and industrialization and technological advances, became more widespread and more complex. It moved beyond city and state boundaries, and it moved from a smoke problem to an "air pollution problem".

Although efforts were not meeting these demands, legislative forums were conducted at all levels of government. Among significant changes was the enactment of the Federal Clean Air Act of 1963. For the first time it provided federal aid for the development and improvement of state and local air pollution programs.[19] Previous federal legislation was directed primarily toward research.

At the state level after 1963 broader and increased responses became visible as the findings indicate. States in all economic categories expended. Thirty-five states in 1967 as opposed to fourteen in 1963 expended for air pollution, and the average expenditures of all states rose from 0.6 cents per capita to 4.0 cents per capita, a sevenfold increase. The causes of this increased response are several: federal legislation, increasing magnitude of the physical problem, and internal efforts by the state governments.

The findings strongly suggest that the federal legislation was an important stimulus in broadening and increasing the response of the state governments. The federal financial aid enabled states at all levels of economic development to take an active part in air pollution control, and it also enabled the states with the more severe conditions to expend greater amounts of money for air pollution. The fact that expenditures and levels of expenditures were related to economic development in 1963 and less so in 1967, strongly indicates the presences of an intervening variable enabling and encouraging all states, regardless of their level of economic development, to expend for air pollution.

The federal legislation has provided an important stimulus for the increased and wider spending, but the states too have played an important role. The air pollution officials and conservation groups have worked energetically for increased control effort.[20] In addition, the state governments, as a political entity, have been attempting to adjust to the pressures of the urban-industrial environment. State revisions in administration, law, and finance, directed toward meeting these urban problems, are more and more common.[21] The specific effort of the air pollution personnel and the general revitalization efforts of the state governments are important factors in explaining this greater committment to one of the most primary problems of our urban society, air pollution.

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THE SOCIO-POLITICAL CHARACTERISTICS OF URBAN GOVERNMENTS ENGAGED IN AIR POLLUTION CONTROL ACTIVITIES

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Introduction.--This paper is concerned with one policy outcome, namely: Why do city governments engage in air pollution control activities? By the very nature of the problem we expect the larger, more industrial and metropolitan sited cities to have a greater probability of having serious air pollution; therefore, we expect a larger proportion of these cities to have air pollution control programs. Obviously, the question is not answered precisely by "because they have an air pollution problem". Too many cities do have pollution problems without having control activity, while other cities without substantial air pollution do have control programs.

In this preliminary investigation, the total subject area will not be surveyed. The primary concern here is to inspect selected characteristics of cities and on the basis of these characteristics to make statements differentiating air pollution control cities from no control cities. Second, an investigation is made of the characteristics of cities that have adopted air pollution control programs since 1965 under the federal grants program of the Clear Air Act of that year. This latter comparison is the basis of an evaluation of the effect of the federal grants program in inducing local governments to enter into air pollution control.

Some Relevant Literature.--Until the advent of computers comparative studies of cities in the United States were rare. Cross-tabulating numerous variables from various survey sources for a large number of cities made the handling of the data a nearly impossible task. Notable work was accomplished in pre-computer days. Among these Adna Weber's *The Growth of Cities in the Nineteenth Century*[1] and William Ogburn's *Socio-Economic Characteristics of American Cities*[2] are exceptional examples of the information that can be derived from comparative studies of cities.

More recently, there has been an interest in many social science disciplines in the construction of typologies of cities. A good example from geography is Howard Nelson's "A Service Classification of American Cities".[3] In this study the author derived a classification of areas, many of them multi-governmental, based on labor force data. With 1950 census data he was able to classify 897 urban concentrations in the United States into nine service groups. In another work the social characteristics associated with the various service groups were examined.[4]

A recent study by sociologists used a process of factor analysis to group 65 variables on cities with populations of 25,000 or greater into fifteen factors. These explained over 90% of the variation among the cities.[5]

Williams and Adrian's *Four Cities* in which four types of cities are described is an example of the development of a typology of governments by political scientists.[6] From the four cities studied, a fourfold classificatory scheme of service government, amenities government, political arbiter government and developmental government, was developed. Although helpful to delineate some of the functions local governments may serve, the classificatory scheme is not helpful in research since the types are not mutually exclusive.

Another work classified local areas as prone to certain policy outcomes based on whether the local populations adherred to "private regarding" or "public regarding" value sets.[7] The value of the above study is enhanced by the response it has generated by other authors to substantiate or reject the theory. Recent studies by Wolfinger and Field,[8] Williams *et.al.*[9] and Lineberry and Fowler[10] are of immediate concern.

The first of these is an evaluation of the theory that "public regarding" or "private regarding" value sets of a population are associated with certain policy outcomes. One conclusion of importance to the ethos theory was that the location variable, region, seems to explain more of the variation among the governments than does certain socio-economic characteristics of the population.

The study by Lineberry and Fowler finds the idea of region as an explanatory variable to be unsatisfactory since region is not a unidimensional variable but is confounded by the operation of many social forces over time. Their preference for explaining differences among policy outcomes is to examine the variations among cities by correlating a number of socio-economic and political variables with policy outcomes. They concluded that Banfield and Wilson's ethos theory was supported by their investigation. That is, that cities that had adopted reform structural changes were less responsive to political conflicts.

Williams, *et.al.* explained the fragmentation of the metropolitan area in terms of a selective process. By examination of various indicators of wealth and status associated with certain governments, and the provision by these governments of varying number and quality of services; the authors concluded that the fragmentation of governments was purposeful. The differentiation of governments allowed the population of an area an elaborate system of "choices" based on income and life style. Since each governmental area within the metropolis reflected, more closely than any other proposed service area, the adaption of the population to its metropolitan role: resistence to change was nearly universal. This explanation very forcibly and logically explains the failure of metro integration plans based on schemes that would substantially alter the specialization of area.

The cited works are not exhaustive of the relevant literature. However, they are quite representative of the studies of which this one is a part and reflect the nature of the disagreements among the researchers. This study is not going to solve whatever technical differences exists. It is assumed, however, that there are valuable findings to be derived through this kind of analysis that are not possible using other methods.

Research Design.--The list of city governments with air pollution control programs used were derived from APCA's *Directory of Governmental*

Air Pollution Agencies[11] and from data supplied by the National Center for Air Pollution Control. Information on the social, economic and political characteristics of these governmental agencies was taken from the listing of Social and Economic Characteristics in the International City Managers Association's *Municipal Yearbook: 1963.*[12] The list of variables are compiled in Table 1.

Selected for comparison are those city governments of over 10,000 population that provide their own air pollution control programs or that participate actively with county governments in air pollution control activities. City areas where the air pollution control activities are provided exclusively by county programs, in which the municipalities do not participate formally, have been excluded from the study.

According to the original definitions, 213 cities over 10,000 population in 1960 were found to have air pollution control programs. No differentiation is made for intensiveness or extensiveness of program at this stage. Lumped together are cities that may well spend a few hundred dollars a year in smoke complaint abatement to multi-million dollar air pollution control programs. The intent is to differentiate the tendency to abate air pollution from the tendency not to abate air pollution.

The no control cities were chosen by random sampling methods from the cities over 10,000 population in 1960 that have no air pollution control programs. The number of cities was chosen to equal the number of cities with old control programs and the cities with new control programs - a total of 223.

Table 1.--Name and Classification of Variables.[a]

Variable	Classification
Metropolitan Status	(1) Central City, (2) Suburb, and (3) Satellite City.
Population Size	(1) Cities with total population 50,000 or higher and (2) Cities with total population below 50,000.
Population Change	(1) Cities that gained more than 10% population during the 1950-1960 decade, and (2) Cities that lost population, or gained less than 10%.
Median Age	(1) Cities with median age population 31 years or younger, and (2) Cities with median age 32 years or higher.
White Collar Employment	(1) Cities with 41% or less white collar employment, and (2) Cities with 42% or higher white collar employment.
Low Income	(1) Cities with 17% or fewer families earning less than $3,000 a year, and (2) Cities with 18% or more families earning less than $3,000 a year.
High Income	(1) Cities with 16% or fewer families earning more than $10,000 a year, and (2) Cities with 17% or more families earning more than $10,000 a year.
Home Ownership	(1) Cities with 50% or less housing units occupied by owners, and (2) Cities with more than 50% housing units occupied by owners.
Manufacturing Ratio	(1) Cities with 50% or less of their labor force in manufacturing employment, and (2) Cities with 51% or more of their labor force in manufacturing employment.
Form of Government	(1) Mayor-council, (2) Commission, and (3) Council-Manager.
Existence of Air Pollution Control Program	(1) Cities with programs before 1965, (2) Cities with no programs, and (3) Cities with federal program grants.

[a] The first ten variables are from the Municipal Year Book: 1963 (Chicago: the International City Manager's Association, 1963); the existence of Air Pollution Control Programs is taken from the Directory: Governmental Air Pollution Agencies (Pittsburgh: APCA and NCAPC-USPHS, 1965).

The number of cities with new control programs since 1965, that fit the criterion of having a program grant, totals 10. This posed a dilemma for the study since the number is small. However, the question of the effect of federal grants on local programs is so important that the decision was made to include them for separate analysis in the paper.

To circumvent the problem of the small number of cities with new programs while preserving meaningful comparisons, the following procedure was used. Whenever possible the cutting point for the social indicator was chosen to divide the number of new programs exactly in half. In this way comparison can be made with the other two groups of cities and between those two classes and new program cities.

Three problems remain under this scheme. First, there is one instance where there is a substantial gap in the indicator variable between the fifth and sixth new program city. Therefore, there is no obviously clear cutting point to be used. In this instance each possible point was tried between the fifth and sixth city and the table which minimized the differences among the cities was used. Second, some of the variables used are nominal and cannot be easily grouped into categories. In two instances it was not possible to group the cities in two classes and this somewhat mars the consistency of analysis. Third, the small number of new program cities makes the analysis too sensitive. That is, the entrance of a few programs could completely reverse the findings. This sensitivity would affect only the statements about the new program cities, not those between the old program and no program cities.

Research Findings.--Each of the indicators was tabulated with the existence or non existence of local air pollution programs. As expected, there seems to be strong associations between certain of the indicators and the existence of an air pollution control program. Each of the ten tables is summarized below.

In Table 2 the relationship between the location of the city within or out of the metropolitan area is examined. Central cities are defined according to the 1960 definition for Standard Metropolitan Statistical (SMSA) areas by the U.S. Bureau of Census. Suburbs are non-central cities above 10,000 population located in SMSA. Satellite cities are cities between 10,000 and 50,000 population not located in SMSA's. Central cities of SMSA were heavily represented in cities with programs before 1965, while no program cities were mainly suburban and satellite cities. Cities with programs since 1965 are more evenly distributed among the three classes than are the old program cities or the cities without programs. There does not seem to be the same affinity for central cities as was evident before 1965.

Table 2.--Metropolitan Status and the Existence of Local Air Pollution Control Program.

Existence of APC Program	Metropolitan Status						Total	
	Central City		Suburb		Satellite City			
	N	%	N	%	N	%	N	%
Old Program	120	56.3	54	25.4	39	18.3	213	100
No Program	17	7.6	114	51.1	92	41.3	223	100
New Program	3	30.0	4	40.0	3	30.0	10	100
Total	140		172		134		446	

The comparison of cities by population size should indicate the same conclusions as the metropolitan status because of the close association between the metro characteristics and population size. This can be seen in Table 3. Nearly all no program cities were under 50,000 population before 1965 while two thirds of the cities with programs were over 50,000 population. Cities entering into air pollution control activities after 1965 are evenly divided in these two population classes. Since 144 of the cities with no programs were between 10,000 to 25,000 population and since the largest new program city was under 100,000 population; the new program cities lie somewhere in between the other two classes in terms of population size.

Table 3.--Population Size and the Existence of Local Air Pollution Control Programs.

Existence of APC Program	Population Size				Total	
	50,000 and Over		Under 50,000			
	N	%	N	%	N	%[a]
Old Program	141	66.2	72	33.8	213	100
No Program	19	8.5	204	91.4	223	99.9
New Program	5	50.0	5	50.0	10	100
Total	168		281		446	

[a] Does not total to 100% because of rounding errors.

Five of the new program cities either lost population during the census decade or gained less than 10% population. The other five gained over 10% population with two of them gaining over 60%. This compares to the national gain of 18.2%. The cities with new air pollution control programs seem to be different from the other two classes on this characteristic. Cities with old programs tended to lose population or make below average gains. Cities without programs tended to make above average gains with few of them losing population (Table 4).

Table 4.--Percent Population Change and the Existence of Local Air Pollution Control Program.

Existence of APC Program	% Population Change 1950-1960				Total	
	Population Loss to 10% Gain		Over 10% Gain			
	N	%	N	%	N	%
Old Program	124	58.2	89	41.8	213	100
No Program	54	24.2	169	75.8	223	100
New Program	5	50.0	5	50.0	10	100
Total	183		263		446	

Comparing the median ages of the cities in the three groups, the similarity between the cities with air pollution control programs, whether old or new, is again evident. These latter groups have higher median ages than the cities with no programs (Table 5).

In the representation of the labor force in white collar occupations, the new program cities are again more like the old program cities, although the difference with no program cities is not great.

Table 5.--Median Age and the Existence of Local Air Pollution Control Program.

Existence of APC Program	Median Age				Total	
	Under 32 Years		32 Years or Higher			
	N	%	N	%	N	%
Old Program	104	48.8	109	51.2	213	100
No Program	146	65.5	77	34.5	223	100
New Program	5	50.0	5	50.0	10	100
Total	255		191		446	

Both program city groups have smaller percentages of their labor force in white collar occupations than cities without programs. This is the variable, mentioned earlier, where there was some difficulty in tabulation because the fifth and sixth new program city had precisely the same percent of persons employed in white collar occupations. For this reason the tabulation shows the new program cities divided unequally (Table 6). As stated previously, the most conservative tabulation was chosen for exposition.

Table 6.--Percent White Collar Employment and the Existence of Local Air Pollution Control Program.

Existence of APC Program	% White Collar Employment				Total	
	20-41%		42-85%			
	N	%	N	%	N	%
Old Program	82	38.5	131	61.5	213	100
No Program	70	31.4	153	68.6	223	100
New Program	4	40.0	6	60.0	10	100
Total	156		290		446	

Recently, income under $3,000 a year has been used as an indicator of poverty for urban families. Similarly, the percent of families and individuals earning under $3,000 a year can be used as a guide to the poverty within one urban government. Using this as the basis of the comparison in Table 7, it can be seen that the cities with old programs and the cities with no programs are not unlike on this characteristic. Cities with new programs are quite different from cities in the two other categories, since they have a tendency to have more programs instituted in areas that have more poverty.

Table 7.--Percent of Families and Individuals Earning Less than $3,000 a Year and the Existence of Local Air Pollution Control Program.

Existence of APC Program	% of Families and Individuals Earning Less than $3,000 a Year				Total	
	0 - 17%		18 - 100%			
	N	%	N	%	N	%
Old Program	147	69.0	66	31.0	213	100
No Program	151	67.7	72	32.3	223	100
New Program	5	50.0	5	50.0	10	100
Total	293		158		446	

Another indicator of wealth is the percent of families in an area earning more than $10,000 a year. Although the $10,000 figure is not as well substantiated a measure for wealth as the $3,000 figure is for poverty, it does seem reasonable that the more individuals and families that attain this income in an area; the more likely does that area contain the resources necessary for a local air pollution control program. On this characteristic the new program cities are similar to the no program cities. The newer cities entering into air pollution control have a higher proportion of their residents in the higher income categories than do the old program cities.

Table 8.--Percent of Families and Individuals Earning Over $10,000 a Year and the Existence of Local Air Pollution Control Program.

Existence of APC Program	% of Families or Individuals Earning More Than $10,000 a Year				Total	
	0 - 16%		17 - 80%			
	N	%	N	%	N	%
Old Program	134	62.9	79	37.1	213	100
No Program	119	53.4	104	46.6	223	100
New Program	5	50.0	5	50.0	10	100
Total	258		188		446	

It is natural to suppose that there would be greater air pollution control in areas where a greater proportion of persons owned their own homes. Knowing that pollution deterioration damage is a serious problem in many urban areas, there is the expectation that the forces for control would be stronger in high home ownership areas and would be manifested in a control program. This is true in cities with old programs where 157 of the 213 cities had home ownership level over 50%. Although there is a substantial difference between old program cities and no program cities in terms of home ownership, both of these groups have greater proportion of its members in the high ownership groups than the new program cities.

Table 9.--Percent of Housing Units Owned by Occupants and the Existence of a Local Air Pollution Control Program.

Existence of APC Program	% Housing Units Owned by Occupants				Total	
	0 - 50%		51 - 100%			
	N	%	N	%	N	%
Old Program	56	26.3	157	73.7	213	100
No Program	22	9.9	201	90.1	223	100
New Program	5	50.0	5	50.0	10	100
Total	93		363		446	

The manufacturing ratio of a city is defined as the ratio of the number of employes engaged in manufacturing to the total number of persons in the labor force. It is expected that the higher the number of persons engaged in manufacturing the more likely there is pollution, and the more likely there exists a control program. It is certainly true that the cities with no programs tend to have smaller numbers of their total labor force in manufacturing occupations. Both the old program cities and new program cities have more of their number in cities with the higher manufacturing ratios.

Table 10.--Manufacturing Ratio and the Existence of Local Air Pollution Control Program.

Existence of APC Program	Manufacturing Ratio				Total	
	0 - 50%		51 - 100%			
	N	%	N	%	N	%
Old Program	102	47.9	111	52.1	213	100
No Program	147	67.7	70	32.3	217	100
New Program	5	50.0	5	50.0	10	100
Total	254		186		440	

The last variable, Form of Government, is a nominal characteristic that cannot be combined into two categories. The structure of the local government has been found by some to be related to certain policy outcomes. Generally, the council manager form is said to be associated with programs that "seek the good of the community as a whole".[13] Although there does not seem to be much difference between the old program cities and the no program cities, the new program cities do tend to have the council manager form of government (Table 11).

Table 11.--Form of Local Government and the Existence of a Local Air Pollution Control Program.

Existence of APC Program	Form of Government						Total	
	Mayor-Council		Commission		Council-Manager			
	N	%	N	%	N	%	N[a]	%
Old Program	97	45.8	28	13.2	87	41.0	212	100
No Program	103	46.6	20	9.0	98	44.3	221	99.9[b]
New Program	2	20.0	-	-	8	80.0	10	100
Total	202		48		193		443	

[a] Three areas had other forms of government and are not included in the table.

[b] Does not add to 100% because of rounding error.

Conclusion.--There are few surprises in the comparison of cities with old programs and cities without programs. As we expect they are quite different not only in their location but also in size and composition of their population. Perhaps, the easiest way to differentiate the two groups of cities is to note that cities with old programs are central cities of metropolitan areas and that no program cities are suburbs and satellites. The other characteristics follow. The old program cities are larger in population, have tended to lose population, have a higher median age, have fewer white collar workers (although not a great difference) and have a greater number of families earning less than $3,000 a year. The no program cities are smaller in population but have gained in population, have a younger population, have more white collar workers, have fewer families earning less than $3,000 a year and have less manufacturing employment.

A few other differences are not so obvious. There is a greater association of old program cities with families with incomes over $10,000 a year than of no program cities and the same variable. Although no program cities had much higher proportions of their population that owned their own homes, the proportion of families in old program cities was quite high. Last, there did not seem to be any difference at all in the two groups as far as the form of government. Each tended to have the same proportions of the three forms with old program cities having more commission governments.

When comparing the new program cities to the other two groups, the findings are more unexpected. The new program cities are similar to old program cities on four characteristics. They tend to have populations with higher median ages, have slightly fewer white collar workers, have more families earning less than $3,000 a year and have somewhat more manufacturing than no program cities. Like no program cities they have fewer families making $10,000 a year than old program cities.

More importantly they are unlike old program and no program cities on five of ten variables. They are not associated with any site within or out of the metropolitan area. In their narrower range of population there are as many new program cities with populations over 50,000 as there are less than 50,000. They are neither associated with population losses or gains but are distributed over the full range of population change. Unlike either of the other two groups new program cities seem to be negatively associated with large proportion of their residents owning their own homes. Last they have a strong relation to the council-manager form of government. All in all, the differences seem to be more startling than the similarities.

A conclusion that can be drawn is that the new program cities have characteristics in common with old program cities that make it likely that they do not have some sort of air pollution problem. However, they do not tend to be the large central cities.

They have two interesting characteristics. One is that there seems to be much lower home ownership in the new program cities. The other is that they have a governmental form which is associated with professional public management. Both of these characteristics can be related to the availability of federal grants.

The availability of funds somewhat offsets the amount of concern generated by the deterioration of one's own property. That is, it is not surprising that cities with control programs have high proportions of home owners, since we view owners as ready to take steps to protect their property. When the barriers to control are lowered, one barrier being local costs of control; then cities with fewer home owners are enticed to enter the field.

The second we can view as the advantages of professionalism in local government. Anyone familiar with the grants program will appreciate that it takes a special kind of skill or training to fill out the forms in a manner to maximize the chances for funding. One can go further and show, perhaps, that professionalism itself attunes a government to the availability and desirability of securing grants. Entrance of governments with professional bureaucracies into the area of air pollution control can be seen as a result of the competence of the bureaucracy.

Again, caution should be used in interpreting the findings because of the small number of cases. The early indications are, however, that the federal grants program is having the effect of encouraging quite different kinds of communities to enter into control activities. Whether the trend will hold up is a question warranting further study.

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AIR POLLUTION CONTROL IN PENNSYLVANIA

by

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Air pollution control in Pennsylvania is now one of the primary concerns of the state government. From 1910 to 1949 it had been considered strictly a local problem to be handed by local agencies. Many programs in smoke abatement in cities like Pittsburgh, Williamsport, Philadelphia, Harrisburg and Wilkes-Barre date from this period.

Suddenly, in 1948, the problem of air pollution broke its local bounds. The terrible experience of Donora during the last week in October in which 17 persons died, compared with an average of two persons for similar periods in previous years, focused attention on the fact that local communities were ill prepared to handle the complex problems associated with air pollution. Although administration of control programs were still more efficiently handled closest to the problem, certain characteristics and events put the administration of effective programs out of the reach of all but the very largest communities.

The following, although not intended to be fully inclusive, are some of the reasons why the state and federal levels of government have become more active in air pollution control. First, at the time of the Donora episode, little was known about the causes of the air pollution. Information was lacking on the sources of pollutants, the nature of pollutants, the concentration of pollutants, the levels of pollutants that were harmful to health or property and the conditions under which pollutants could build up to adverse levels. Problems related to unemployment, location of industry, transportation and tax programs were also related to control since in many cases differentials in the permissiveness of local ordinances made one or another locality more attractive to certain industries, while industries that were not economically sound insisted that the extra burdens of control would eliminate their profits and make them operate at a loss. Last there were a group of problems related to local government boundaries, that is, the inability of some of the smaller governments to recruit and retain specilized engineering personnel, or to raise the necessary monies to maintain high level air pollution control programs. For these reasons and others the Commonwealth had to assume greater responsibility for air pollution control.

Until 1960 air pollution problems were handled by the air pollution section of the Division of Occupational Health of the Commonwealth's Department of Health. On January 8, 1960, Governor David L. Lawrence signed into law the "Air Pollution Control Act."[1]

Under this statute it was the declared policy of the state:

> to maintain such a reasonable degree of purity of the air resources of the Commonwealth as shall be technically feasible, economically reasonable, and necessary for the normal health, the general welfare the property of the people of the Commonwealth. The measures for the accomplishment of this purpose shall not unreasonably obstruct the attraction, development and expansion of business, industry and commerce within the Commonwealth[2]

The language of the act makes plain the intent not to proceed at such a pace as to endanger the economic health of the state. This point is made to emphasize that air pollution, although of great importance, is only one of the matters of concern of Pennsylvanians.

The Act set up in the Department of Health, an Air Pollution Commission composed of five public and six private members. The public members are the Secretaries of the Department of Health, the Department of Commerce, the Department of Labor and Industry, the Department of Mines and Mineral Industries and the Department of Agriculture. The private members consist of a representative of the general public, an industrial toxicologist experienced and competent in the toxicology of air pollutants, three representatives of industry and a professional engineer experienced in air pollution control. Among the powers of the Commission are those of adopting rules and regulations for the control of air pollution, hearing complaints referred to them, establishing maximum limits on pollutants permitted to be emitted and issuing orders for compliance.[3]

The Commission has the power to designate regions of the Commonwealth wherin Associations consisting of a representative of each county in the region are established. The Associations review all proposed regulations of the Commission, suggest regulations and are the primary level for the consideration of complaints. If within six months the Association does not believe it is progressing toward a solution of a problem, the complaint is referred to the Commission.[4] To date the work of the Associations has been highly regarded by the state control officials. Of all of the complaints received by the Commission since the adoption of the Air Pollution Act, 69% have been abated by the work of these Associations (Table 1). The air pollution engineers of the Department of Health act as the technical arm for the Associations and the Air Pollution Commission by investigating complaints and issuing reports on the nature and scope of alleged air pollution problems. In the seven years that the state's program has been in effect a number of regulations has been adopted (Table 2).

This sketch hardly does justice to the state program which is responsible for the solution of all air pollution problems in Pennsylvania except for the areas under the jurisdiction of the Allegheny County and Philadelphia City programs. The Division of Air Pollution directs the activities of approximately sixty highly trained specialists and maintains a number of laboratories. Extensive studies of the Beaver Valley and Johnstown area have been completed and the division is currently not only expanding its activities, but also putting into operation a computerized telemetric air pollution surveillance network. The first station is in operation in Allentown. When fully operable, the network will allow instantaneous evaluation of the air pollution potential in the Commonwealth and will form the basis of an alert system designed to progressively reduce activities that cause air pollution, as the potential for the build-up of pollutants increases.

When faced with a description of the state program, one is often led to believe that there is no opportunity for local action. This is not true. As everyone realizes governmental activities that are to modify behavior need to be administered locally. This is, of course, reflected by the state's decentralization of its program in the seven health regions (see map, headquarters are in Kingston, Williamsport, Meadville, Pittsburgh, Lewistown, Reading and Philadelphia.)

The Air Pollution Commission has under consideration a regulation to create municipal type enforcement programs in certain areas of the Commonwealth. The areas to be chosen are those that have a substantial air pollution problem and where the people in the area share a common pollution concentration. The "air basin" so designated is larger than any local jurisdiction within its boundaries. These proposed air basins are to have a relatively autonomous state enforcement program. Air quality standards are to be developed specifically for them based on the pollution mix and concentration and the local meteorological conditions. This is a clear recognition by the Commission that the air pollution problem in many cases does not fit the existing governmental boundaries.

Local governments do have a great responsibility in the area of air pollution control. Although there are many instances where the air pollution problem crosses existing boundaries, there are many other instances where the problem is within the jurisdiction of one political unit (Table 3). In a survey of over 800 communities in Pennsylvania in 1959, over 40% of the problems were completely within the jurisdictions of single local governments. Certainly, in each of these 218 communities a local program could have effectively dealt with the air pollution problem. Yet, fewer than 25 communities in the state had any air pollution or smoke abatement programs with 17 of these 25 spending less than $1,000 per year on their control activities.

Undoubtedly, many of those communities whose problems originate in another community, or where the problem exists in a few communities simultaneously (see Table 3), could take advantage of recent developments in interlocal governmental arrangements and can create regional programs to jointly provide for air pollution control. At the time of the adoption of the state program only the Lehigh Valley Regional Air Pollution Control Program was in operation (at that time consisting of Lower Mt. Bethel Township, Nazareth Borough, Northhampton Borough, Stockertown Borough and Whitehall Township). Recently a multi-jurisdictional control program has been initated in the York area making it the second interjurisdictional air pollution control program in the state.

A local program is necessary for other reasons. Certain kinds of air pollution nuisances are temporary and intermittent. Regionally based programs, because of the travel distances involved, often do not react quickly enough to be able to observe the alledged pollution source. Often many trips are necessary before the first measurement and observation can be made by the regional engineer. This is wasteful of highly priced professional persons, and the delay can be very annoying to the person suffering from the pollution. Locally based programs have a much faster response time to this class of problem.

By default, another class of problems is the responsibility of the local government. Many activities such as leaf burning and home incineration can be quite objectionable to certain citizens and can affect their health or the enjoyment of their property. The state program lacks the manpower necessary to police this problem throughout the state and has restricted its responsibility for it. For example, under Regulation 3, the Commission has adopted a rule that, in effect, makes problems of open burning from home of two families or less the responsibility of the local municipality. It has also restricted its action to control problems from combustion units only above a minimum BTU rating.

The most important reason for a local program is to protect the quality of the existing air and in some cases to try to improve it. All local governments in Pennsylvania, except Third to Eighth Class Counties, have some authority to control smoke or air pollutants. In an era of increasing population concentration and with the concomittant rise of industrial and commercial enterprises (some of these producing new pollutants whose effects are as yet unknown) a preventive type of municipal program is a necessity. Activities co-ordinated with building, zoning and electrical codes, which would require a permit and inspection before pollution potential equipment or activities are started, could do much to protect local air resources. Preventive programs now, before pollution is a menace to health or property, is the least costly approach, as similar programs in fire prevention have demonstrated.

Last, but perhaps most important, local programs are needed in those jurisdictions where the population desires the quality of its ambient air higher than the state's minimum. It is obvious that a standard promulgated on a statewide, regional or air basin basis is one that is the result of many compromises. There are levels of pollution, for example, that have not been demonstrated to be of danger to human health that are, however, harmful to certain plants. The margin of safety desired by a local population may be higher than that agreed upon by all the interested groups within a large region. Since a program to maintain air quality is cheaper than one that must reduce existing levels of pollution, those communities that are satisfied with their current air quality must protect it by organizing an air pollution control system now. It must be remembered that the process for deciding on the level of air quality desired, the adoption of the appropriate standards and the organization of an administrative program is a relatively long one. The lag time between original intent and actual operation of a program is sufficient time to experience a substantial increase of air pollution.

Both the state and federal governments are anxious and ready to help local communities to engage in air pollution control activities. Within the limits of its resources the state Division of Air Pollution through it Technical Services Section will make surveys of especially troublesome air pollution problems. The state has gathered a great deal of data in many communities of the Commonwealth on the kinds and levels of pollutants and can give technical advice on program organization and requirements. The Air Pollution Act recognizes the importance of local programs by making approved local programs autonomous of state control.

There are two autonomous programs in Pennsylvania at this time. The better known is the Allegheny County Program since the area experienced such a dramatic decrease in smoke and dust abatement from 1949 to 1959. In that period, for example, the number of "heavy smoke" days as observed by the United States Weather Bureau decreased from 280 days a year to none. Philadelphia's program, located in the Health Department as is Allegheny County's. has also made progress. These agencies, located in major metropolitan areas, both receive over 2,000 complaints a year. Recently both areas have experienced the new type of air pollution; that is, fine suspended particulates and various mixtures of gaseous pollutants, especially sulfur dioxide (see Table 4). Philadelphia has even experienced Los Angeles type smog -- a particularly distressing sort of pollution that characteristically makes eyes smart and water, and whose pollutants NO_x, Hc, O_3 and Peroxyacetyl nitrate (PAN) are especially toxic to plants and endanger the health of persons suffering from respiratory ailments. For these reasons both of the programs are expanding their activities to a budgetary and manpower level equal to the state's program.

The other local programs in Pennsylvania meeting the standards for receiving federal grant are the Lehigh Valley Regional Program which preceeds the state program in longevity and the Greater York Regional Program which has just been organized with state and federal assistance. Both of these are good examples of how co-operative agreements among smaller local units of government can produce a program whose area transcends the boundaries of any one unit. A third interlocal program now in the planning stage is that of the Allentown-Bethlehem Bi-City Health Department, indicating that the larger urban areas can also use the same mechanism to solve their interjurisdictional problems.

There are other local programs in the planning stage encouraged by the state and federal programs of assistance. Since the Federal Clean Air Act of 1965, program grants have been available for local programs on a matching basis. This is continued under the newly passed Air Quality Act of 1967 whereby grants are available to local communities up to 2/3 of the cost of planning, developing, establishing or improving programs, as are grants up to one-half of the costs of

TABLE 1 -- Abatement by Regional Associations in Pa., 1960-1967[a]

Number of Cases Resolved at Regional Level up to June, 1967	816
Number found to be no problem by the Associations	360
Number pending solution	385
Orders issued by Air Pollution Commission	57
Total Number of Cases Referred to Regional Associations	1,618

[a] From Air Pollution Control in Pennsylvania, (Harrisburg, Pennsylvania Department of Health, 1967),7.

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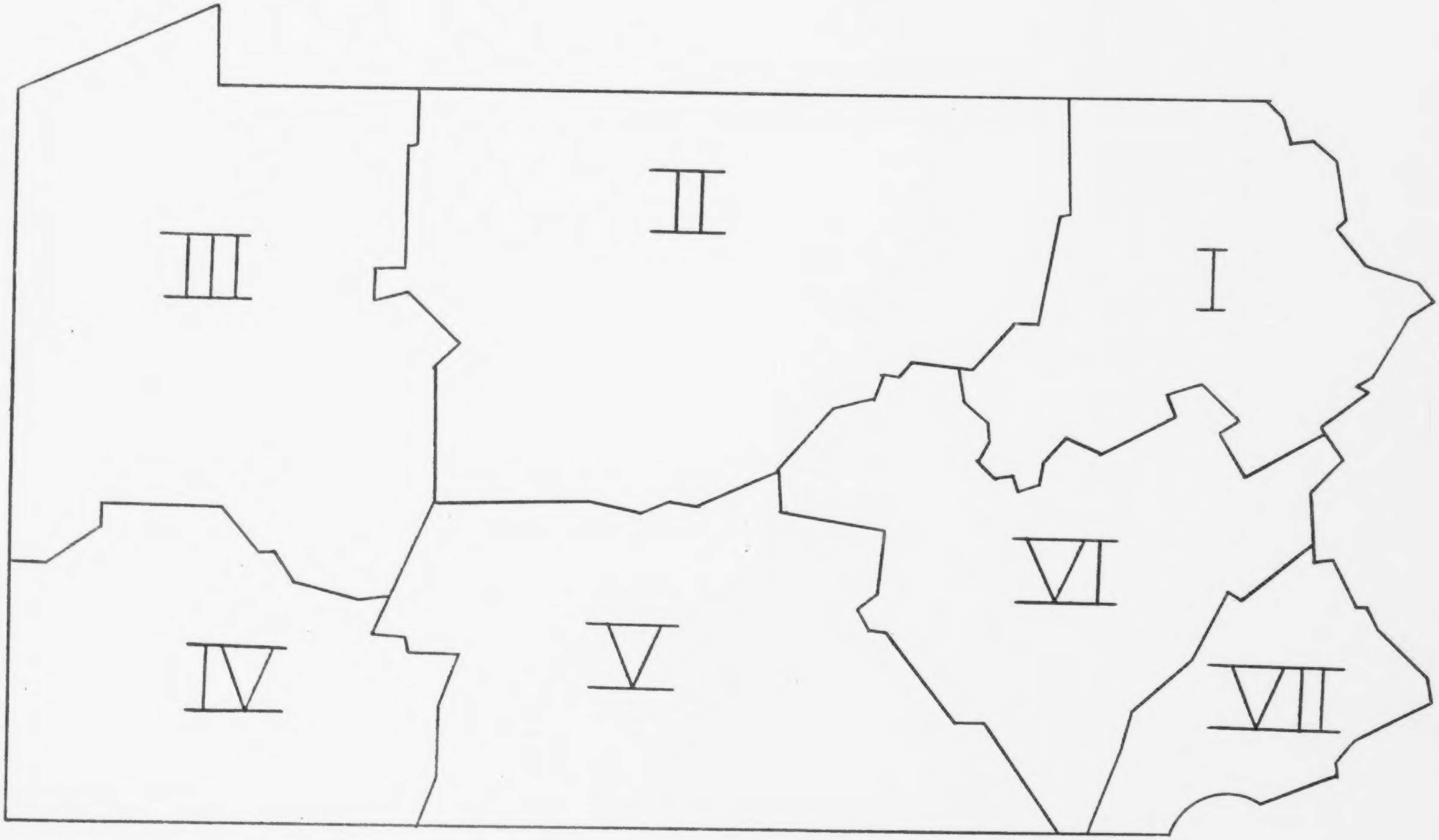
TABLE 2 Regulations Adopted by the Pennsylvania Air Pollution Commission

TITLE	DATE OF ADOPTION	DESCRIPTION
Regulation I - To Prevent and Control Air Pollution from Coal Refuse Disposal Area	May 29, 1967	Sets up a permit system for operating coal refuse areas. Procedure is set up to eliminate burning coal refuse piles.
Regulation II - To Control Air Pollution from Open Burning Operations	May 29, 1962	Prohibits open burning and salvage burning operations that cause air pollution
Regulation III - For the Prevention and Control of Air Pollution by Requiring Plan Approval Prior to the Combustion or Modification of Combustion Units	Oct. 22, 1962	Sets up a procedure by which approval must be obtained, based on an engineering evaluation, of all incineratior and combustion units of a size that may cause air pollution problems
Regulation IV - To Control Local Air Pollution from Sources of Particulate or Gaseous Matter Emissions	March 15, 1966	Defines "air basins" and "local" air pollution. Sets up guides for compliance of particulate emissions. Guides for gaseous emissions are under review.

PENNSYLVANIA AIR
POLLUTION REGIONS


I
II
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VII

TABLE 3 -- Size Distribution of Communities with Objectionable Pollution[a]

Population Range	No. Surveyed	Number Reporting Objectionable Pollution			Percent Reporting Objectionable Pollution	Pollution Source		
		Major Problems	Minor Problems	Total Problems		Local	Political Jurisdiction	Combination of both
less than 2,500	71	15	29	44	62	28	9	7
2,501-5,000	345	27	163	190	55	86	55	49
5,001-7,500	169	15	89	104	62	39	32	33
7,501-10,000	65	8	28	36	55	20	8	8
10,001-15,000	63	6	27	33	52	11	3	19
15,001-20,000	39	9	21	30	77	16	4	10
20,001-25,000	12	1	7	8	67	6	1	1
25,001-50,000	20	4	11	15	75	5	3	7
50,001-100,000	11	2	8	10	91	5	0	5
greater than 100,000	6	4	2	6	100	2	0	4
TOTAL	801	91	385	476	696	218	115	143

---

[a] Taken from David M. Anderson, Jan Lieben and Victor Sussman, *Pure Air For Pa.* joint publication by Pa. Department of Health and the U.S. Public Health Service (November, 1961), 6.

TABLE 4 -- Comparison of Pollutants Reported in Large and Small Communities[a]

Pollutant	374 Communities with less than 10,000 population No. Reporting	Percent	104 Communities with more than 10,000 population No. Reporting	Percent
Particulate				
Smoke and Flyash	231	62	79	78
Refuse Smoke	169	45	53	52
Industrial Dusts	156	42	36	35
Metal	37	10	18	18
Acid Mists	4	1	2	2
Miscellaneous Dusts	42	11	10	10
Gaseous				
Industrial Gases	125	33	49	48
Refuse Odors	52	14	13	13
Sulfur Gases	34	9	20	20
Sewage Odors	38	10	11	11
Miscellaneous Odors	22	6	6	6

[a] Taken from: Anderson, Lieben, and Sussman, 8.

FOOTNOTES

[1] Air Pollution Control Act, January 8, 1960, P.L. 2119 (1959).

[2] Ibid., sec. 2.

[3] Ibid., sec. 5.

[4] Ibid.

[5] Anderson, David M., Lieben, Jan, and Sussman, Victor, Pure Air for Pa. joint publication by Pa. Department of Health and the U.S. Public Health Service (November, 1961), 73.

[6] Third to Eight Class Counties can through other powers, most notably Planning and Health Codes, the ability to greatly affect the quality of air in their jurisdiction, but have no explicit air pollution control authority. For a summary of air pollution powers of Pennsylvania communities see: Anderson, Lieben, and Sussman, Pure Air in Pa.

[7] Air Pollution Control Act, January 8, 1960, P.L. 2119 (1950), sec. 12.

4-1

STATE AIR POLLUTION CONTROL ADMINISTRATION IN THE COMMONWEALTH OF PENNSYLVANIA

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Purpose.--The purpose of the thesis is to describe and analyze the development and administration of the Pennsylvania state air pollution control program. The research is specifically directed toward determining what physical and social environmental factors and organizational factors affect the development and administration of the program.

The program is divided into its several activities (e.g. abatement, permits budgetary ect.). Each activity, for analytical purposes, is discussed in terms of inputs, the demands, information and resources received by the organization; the throughputs, the perception and management of the inputs; the outputs, results of each activity; and change, the reaction to and alternation of the program or any part of it. For each of these activities general questions are asked about the input, output, and the change. Below is a list of these questions:

Input: What factors account for the quantity, type, and scope of input?
Output: What factors account for the quantity and quality of the output?
Change: What factors account for the speed, amount, and type of change?

Methodology

The research design was based on an open-system approach[1] using macro variables. An open-system, as defined by James D. Thompson[2] and Katz and Kahn,[3] means the organizational behavior is studied in the light of environmental forces. The closed-system, on the other hand, precludes the effects of environment; the inner working of the organization is the focus. The closed-system approach is exemplified by Taylor (the scientific management school), Gulick and Urwick (the administrative management school), and Weber (the bureaucracy school). Barnard, Simon, March, Cyert, Thompson, and Katz and Kahn are writers who use the open-system method. Both approaches lead to some truth; alone, neither affords a complete understanding of complex organizations. The open-system approach was selected mainly because the environment seems to play such an important role in air pollution control organizations. Besides, studying the organization in terms of environmental effects does not preclude looking at the inner operations of the organization.

The second element channeling the research is the use of macro variables. Macro variables are by definition the large variables, such as, political, structural, and legal. They usually exclude psychological factors. Such aspects as sentiment, cliques, and status striving are not systematically studied, although they do have an affect on organizational behavior.

Research Design

Following is a list and short definitions of the variables:

1. Environmental
   a. political--the position and power of the participating groups
   b. economic--the economic stability of the area
   c. technological--the technical ability to detect and control air pollution
   d. physical--the population density, size, and terrain of the area.
2. Organizational
   a. policy--the legally stipulated conditions for administering the control program
   b. resources--the amount of fiscal and manpower resources
   c. legal--the requirements, strictness, and comprehensiveness of the laws, rules, and regulations.
   d. managerial--the coordination and direction of men, material, and information.

Historically, the Donora air pollution episode in 1948 was the primary reason for the initation of control activities on the state level. Previous to 1948 air pollution control was strictly a function of the local units.

During the years 1948 to 1959 the state operated its air pollution control activities under the General Health Law. The law limited the issuance of abatement orders to cases where the public health was endangered. Because of the nature of the law, the state did little during these years except study the air pollution problems and recommend solutions. Whether or not the recommendations were followed was the decision of the polluter.

In order to broaden the powers of the state in air pollution control, the Department of Health in 1955 submitted an air pollution control bill to the legislature. The bill brought two issues to the fore. One, where in the government structure should the air pollution policy-making power reside? Two, what should the air pollution control policy be? That is, should the enforcement system be weighed in the direction of cooperation and conciliation or in the direction of orders, fines, and penalities.

The first issue concerned the location of the power. Initially the Department proposed in their bill that the rule-making and regulation-making power be vested in the Advisory Health Board. The Advisory Health Board was an independent board, made up of medical men appointed by the governor and ex-officio government officials. Their function was to make regulation for health standards in the health programs operated by the state. Although the Advisory Health Board was an independent board, placement of these powers in the board's hands would have the regulation-making authority closer to the thinking of the Department.

The second important issue concerned the control policy, that is, how rapidly and in what manner should air pollution control be pursued. Should control be primarily conducted through cooperation and conciliation or through such pressures as abatement orders? The State Department of Health preferred to have a system weighed more toward the use of orders; whereas, the industrial community preferred the cooperation and conciliation approach.

The fact that the important issues were resolved in favor of the industrial view can be explained in terms of the state of the political and economic environment.

The big industries were politically strong and had sound arguments to support their points of view. First, the argument runs, industry should have representation on an independent Air Pollution Commission because industry would be one of the most important sectors effected. Second, since the economy was in a recession and control technology was not well developed, the control policy should be based primarily on economic and technical criteria and executed through cooperation and conciliation.

After a five-year struggle which started in 1955, a state Air Pollution Control Law was passed. The law became effective in January of 1960. The organizational structure set forth in the 1960 law includes: (1) the Air Pollution Commission, (2) the Regional Associations, and (3) the Department of Health (Figure 2, 3). The Air Pollution Commission has a wide range of powers and duties. The Commission formulates policy, promulgates regulations, and holds hearings. The primary duties of the Associations are to obtain abatement through cooperation and conciliation and to aid the Commission in tailoring the regulations to local needs. The chief duties of the Department are to work with polluters in an effort to obtain abatement and provide technical information to the Commission and the Associations.

Although these three components are closely involved in the air pollution control process, they have different orientations. The Commission is oriented toward economic considerations; the Association toward local needs; and the Department toward technical considerations.

The Administration of the Program.--The abatement process which is the activity receiving most of the organizations time and resources, consists of receiving the complaints, investigating the complaint, registering the complaint with the respective Association, recommending abatement action, and, if necessary, referring the case to the Commission and requesting an abatement order (Figure 4).

The case input of the abatement process was described in terms of number of cases and type of cases. The number of cases increased each year. In region I the number increased 277% since 1962 (Table 1). The type of cases varied by region. For example, problems from burning culm piles predominated in region I; problems from lumber and wood producers predominated in region II. Region V had a variety of problems; with air pollution from steel mills a major one. All regions experienced significant problems from burning dumps (Table 2).

The case output was measured in terms of abatement lag and abatement time length. Lag measured the difference between the case load and the number of resolutions. From 1962 to 1966 the lag increased 325% (Table 3). The average time it took to abate a case, the second measure of output, was about nine months. This average varied widely with the type of case. Paper mills, power plants, cement plants, burning culm piles, chemical producing plants, all averaged over twenty months. Junkyards, laundries, and food producers averaged less than eitht months (Table 4). In region I the abatement time length (calculated for all cases) decreased 31% since 1962(Table 5).

The increased input was due to greater publicity about air pollution, a larger number of air pollution control personnel in the Department, and increased public discontent with air pollution. The regional variation in the type of case input was a reflection of the industrial structure of the region. Region II, for example, has a large number of lumber and wood producers and consequently a large number of problems from these procucers. The high number of dumps in these regions reflected the poor municipal management and control of refuse disposal. The incompleteness of the input reflected the poor information system. An information system totally reliant on citizen complaints does not provide for completeness of input. Citizens often fail to report air pollution problems either because they do not realize the problem exists or they do not want to report it.

What factors accounted for the recorded lag and abatement time length? Policy, legal basis, manpower, location of decision-making power and increased demand by the public were the primary factors. The policy set the pace for the output by requiring that control be attained through cooperation and conciliation. The strict due process requirements were a factor for lengthening the abatement time length. The air pollution regulations were useful tools and partically responsible for the decrease in the abatement time length. The productivity of the manpower increases were limited by the policy and due process. Manpower increases, in addition, were not keeping pace with the increased input. The location of dicision-making power in the Commission and the Association was another factor for slowing down the output. Not only did these bodies meet infrequently, but they were also oriented toward slower procedures. The validity of the above analysis is limited by the lack of comparative data. Although it seems likely that abatement based on a system of orders rather than cooperation would be faster, further research and experience is needed on the matter.

The third analytical question pertained to changes in the abatement process or related elements. Change has occurred in four aspects: (1) the due process requirements, (2) the number of regulations, (3) the manpower complement, and (4) the hearing procedure. The due process requirements were extended from one administrative hearing to two administrative hearings. The manpower complement was increased in quantity and kind. Since 1962 one regulation was added and one is in preparation. Finally, the Commission promulgated a rule providing for a hearing board. In all instances the change did not come easily, but was previewed by conflict and compromise.

In several important areas change was suggested, but has not occurred. These areas included the information system for the case input, the status of the

Associations, the location of the order-issuing power, the declaration of policy, and the composition of the Commission. In all areas except the first, change has not occurred because of the policy significance of these areas. Change in these areas would have an extensive effect on the direction of the organization. The passage of House Bill 926 which would give the Department of Health the order issuing power would allow the Department to pursue control activities at a more rapid pace.

The second process studied was the air pollution survey. The general purpose of the survey is to detect and determine the nature and extent of air pollution in the Commonwealth. The survey process consist of three steps: (1) planning and development, (2) field operations, and (3) evaluating the data and writing the report. The Division personnel did the overall planning and coordinating and the sophisticated testing and analyzing. The regional people did the specifics of the planning and most of the field work.

Over the years the survey input has been fairly steady, except for 1966 (Table 6). In 1966 surveys covering the largest population were initiated. The number and size of the surveys started depended on demand and supply. The demand has been increasing, but the limited supply of resources has prohibited initiating more than two or three surveys per year. The area selected usually depends on information needs and program plans, but sometimes areas are selected because of political pressure.

The speed and quality of the survey output is a function of the level of technology, the resources available, and the effectiveness of the intra-departmental communications. Poor technology and scarce resources have hindered the speed and quality of the survey output; communication, thus far, has not.

The permit process is the third process of the technical program. The purpose is to prevent pollution from potential sources. The process is based on regulation I (permit for coal refuse piles) and regulation III (permit for combustion units). The process consists of getting information about the construction of these sources, evaluating the information, and deciding whether or not to accept the application.

In the regions studied, the input (i.e., the applications) for regulation III permits have increased gradually; whereas, the input for regulation I permits has not shown any sustained increase (Table 7). The increase in regulation III input was caused by a higher rate of construction and improvements in the input information system. The failure of regulation I permits to increase reflected the decline in mining activity.

Although the regulation III input has risen, the input is far from complete. The incompleteness is a result of the Division policy and continued flaws in the information system. The Division has not emphasized the permit process, and the information system does not provide the data necessary to locate the combustion units.

The output of the permit process was discussed in terms of the criteria used for approval of regulation III permits. The study revealed that the Commission followed the technical criteria of the Department in all cases, except when large economic benefits were at stake. The specific instances were the approval of four power plants that did not meet the technical criteria of the Department.

One analytical question concerned the budgetary levels. According to Department records, air pollution expenditures have increased 308% since 1962. The increase can be explained, for the most part, by the rising public demand for clean air and fiscal encouragement provided by the federal government.

Although the budgetary levels have been increasing, the personnel in the Division felt the increase was not sufficient to keep pace with the public demand for clean air. The lack of a strong clientel group was the reason given for the drag on budgetary levels.

In regard to the public relations process, the main question concerning the public relations process was the content of the public relations program. The content was evaluated as having a conservative orientation. Two reasons were given to explain the conservative orientation. First, public bureaucracies are supposed to be neutral. Second, the different orientations of the Commission and the department toward air pollution control have a compromising effect on the content of the public relations program.

FOOTNOTES

[1] Although this approach is called an open-system approach, it is not a system analysis.

[2] James D. Thompson, Organizations in Action (New York: McGraw-Hill Book Company, 1967), p. 6.

[3] Daniel Katz and Robert L. Kahn, The Social Psychology of Organizations, (New York: John Wiley and Sons, Inc., 1967), p. 8.

Figure 1

The Important Variables and their Effects

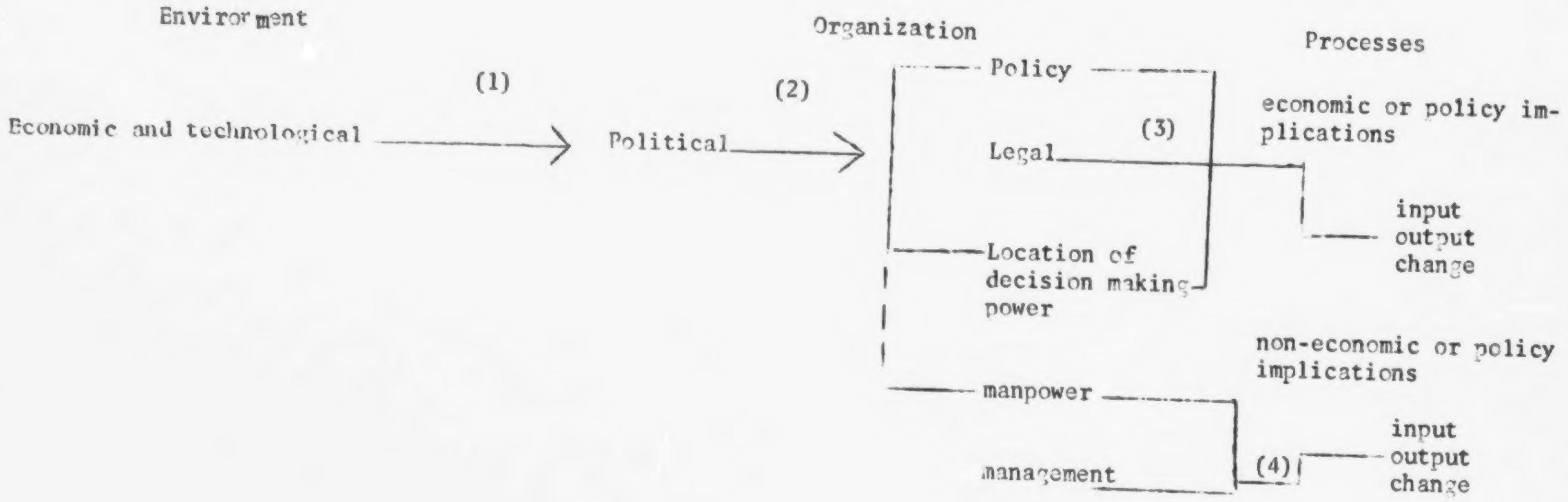

Environment
Organization
Processes
(1)
(2)
Economic and technological
Political
Policy
Legal
(3)
Location of decision making power
economic or policy implications
input
output
change
non-economic or policy implications
manpower
management
(4)
input
output
change

Figure 2

ORGANIZATIONAL COMPONENTS INVOLVED IN AIR POLLUTION CONTROL

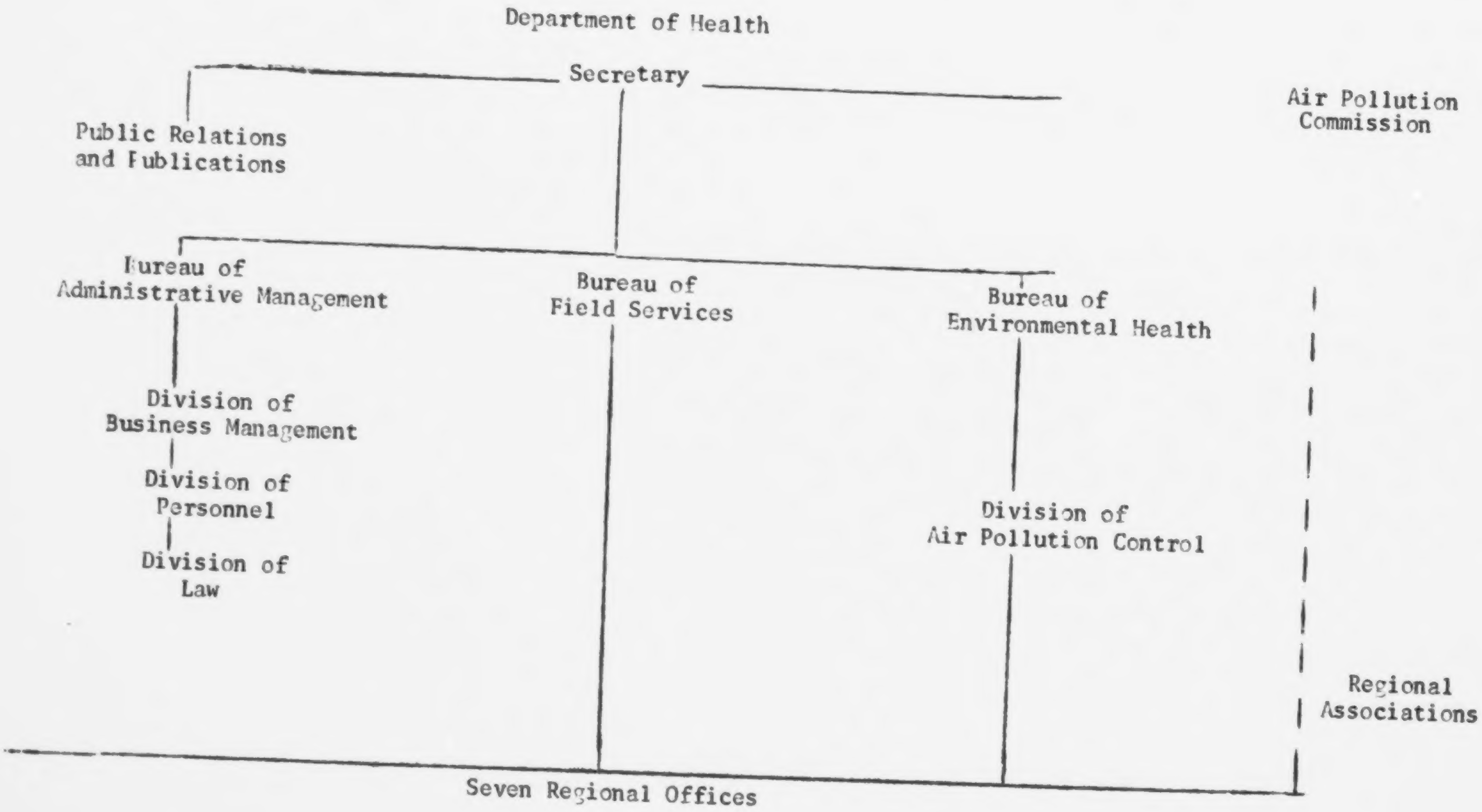

Department of Health
Secretary
Public Relations and Publications
Air Pollution Commission
Bureau of Administrative Management
Bureau of Field Services
Bureau of Environmental Health
Division of Business Management
Division of Personnel
Division of Law
Division of Air Pollution Control
Regional Associations
Seven Regional Offices

Figure 3

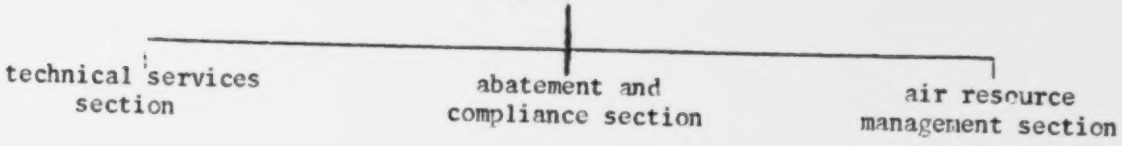
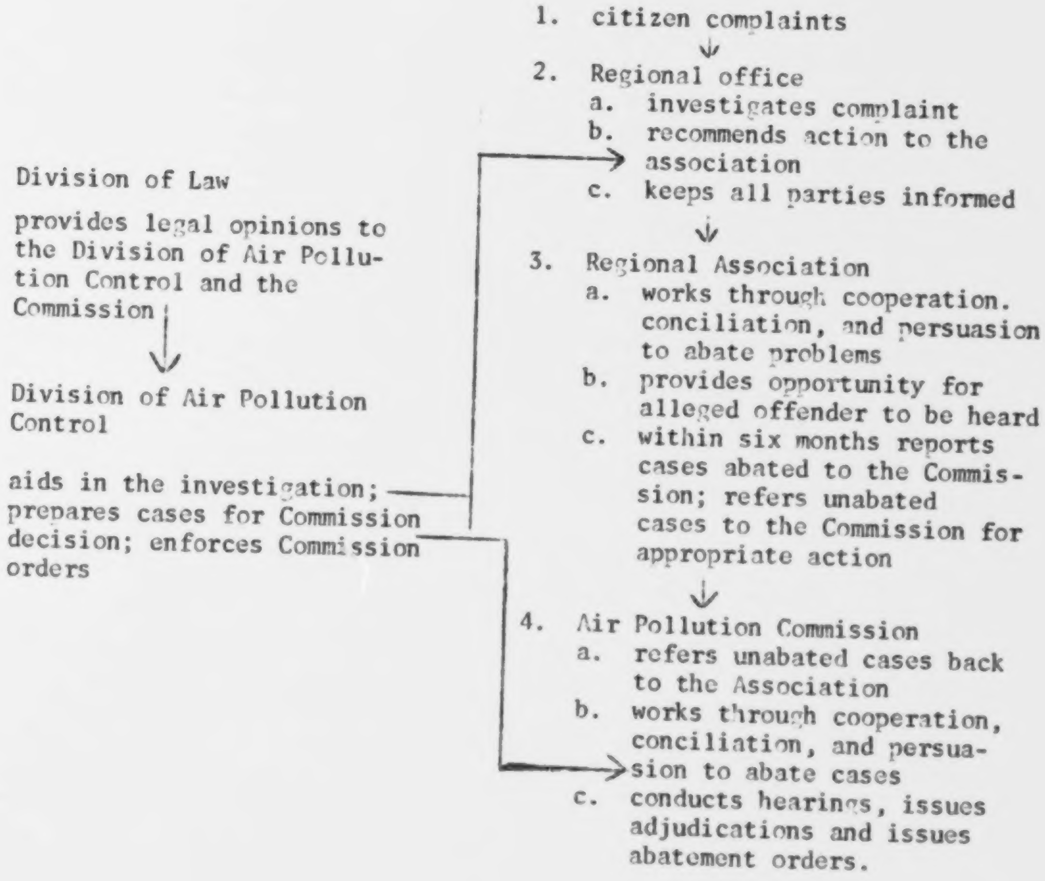

Program Director
technical services section
abatement and compliance section
air resource management section

Figure 4

THE ABATEMENT PROCESS



1. citizen complaints
2. Regional office
   - a. investigates complaint
   - b. recommends action to the association
   - c. keeps all parties informed
3. Regional Association
   - a. works through cooperation. conciliation, and persuasion to abate problems
   - b. provides opportunity for alleged offender to be heard
   - c. within six months reports cases abated to the Commission; refers unabated cases to the Commission for appropriate action
4. Air Pollution Commission
   - a. refers unabated cases back to the Association
   - b. works through cooperation, conciliation, and persuasion to abate cases
   - c. conducts hearings, issues adjudications and issues abatement orders.

Division of Law

provides legal opinions to the Division of Air Pollution Control and the Commission

Division of Air Pollution Control

aids in the investigation; prepares cases for Commission decision; enforces Commission orders

TABLE 1

ANNUAL CASE INPUT 1962 - 1966

Year	# Cases	# + or -	% + or -
1962	22		
1963	29	+7	+31
1964	23	-6	-20
1965	70	+47	+204
1966	83	+13	+18

Source: Unpublished material from region I files

TABLE 2

INDUSTRIAL CLASSIFICATION OF CASE INPUT FOR THE STATE AND SELECTED REGIONS

Industry	State	Regions I	Regions II	Regions V
	%	%	%	%
1. Farms	1.6	---	5.7	.5
2. Agriculture	1.5	1.9	1.6	3.0
3. Culm banks, anthracite	2.4	16.0	---	---
4. Culm banks, bituminous	7.6	---	11.0	4.0
5. Mining and quarrying of non-metallic minerals	2.5	---	4.9	4.0
6. Food and kinder products	5.0	2.5	5.7	9.0
7. Textile mills	1.6	1.3	---	1.0
8. Lumber and wood products	2.9	3.1	7.3	2.0
9. Paper and allied products	1.8	---	1.6	3.0
10. Chemical and allied products	5.6	---	4.0	1.5
11. Petro and coal products	4.9	1.8	4.9	4.6
12. Stone, clay and glass	6.0	1.9	7.3	9.0
13. Primary metals	7.9	2.5	3.2	6.4
14. Fabricated metals	3.3	---	0.8	1.6
15. Utilities and dumps	11.0	18.0	9.7	5.7
16. Personal services	2.8	2.5	0.8	3.6
17. Junkyards	4.0	6.0	1.6	5.0

Source: Unpublished material from the Division and Regional offices.

TABLE 3

MEASURED "LAG" IN THE ABATEMENT PROCESS 1962-1966

Year	Load	Cases resolved and transferred	Lag
1962	22	7	15
1963	44	29	15
1964	38	10	28
1965	98	57	41
1966	124	57	67
1967 (9 mos.)	127	26	101

Source: Unpublished material from region I files.

TABLE 4

REGION I

AVERAGE ABATEMENT TIME FOR ALL CASES 1962-1966

Year	Average for all cases
1962	14.5 months
1963	14.3 months
1964	22.1 months
1965	12.9 months
1966	9.5 months

TABLE 5

ESTIMATED AVERAGE ABATEMENT TIME LENGTH

Industry	Mean (in months)	Rank
Paper mills*	30.0	(1)
Utilities	29.0	(2)
Non metal mining	24.5	(3)
Stone, clay & glass	23.54	(4)
Chemical	21.83	(5)
Anthracite	21.54	(6)
Prim. metal	19.6	(7)
Petro. and coal	21.83	(8)
Bituminous	12.0	(9)
Lumber	9.8	(10)
Fab. metals	9.6	(11)
Dumps	9.38	(12)
Personal service	8.37	(13)
Food products	7.5	(14)
Agriculture	6.66	(15)
Junkyards	5.42	(16)

*Since there were very few cases of paper mills in the sample, this average may not be representative of the true average.

TABLE 6

AIR POLLUTION SURVEYS*

Year	Name of Survey	Estimated population covered
1960	Shenango Valley	55,000
	Lancaster	61,000
	Greater York	75,000
1961	Beaver Valley	100,000
1962	Lower Schuykill Valley	40,000
	Greater Allentown, Bethlehem, Easton	215,000
	Greater Greensburg	65,000
1963	Greater Johnstown	25,000
	Wyoming Valley	200,000
1964	Harrisburg Area	100,000
1965	Mon Valley	85,000
	Reading	99,000
1966	Williamsport	42,000
	Erie	139,000
	Butler Valley	50,000

Source: Unpublished material from Division files.

*The surveys listed here are limited to those conducted for the purpose of writing regulations or initiating local programs.

TABLE 7

REGION I AND V: NUMBER OF PERMIT APPLICATION FOR THE YEARS 1962-1968

Years	Region I regulation		Region V regulation	
	I	III	I	III
1962	26	--	N.A.	--
1963	8	9	N.A.	7
1964	7	14	N.A.	15
1965	11	16	N.A.	16
1966	20	18	2	19
1967 (6 mos.)	7	17	0	14

Source: Unpublished material in region I and region files.

CYBERNETICS AND ORGANIZATION THEORY
A QUANTITATIVE METRIC FOR INFORMATION FLOWS

by

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Introduction.--The agency studied is the Allentown-Bethlehem Bi-City Health Department. The major focus of this work is upon the air pollution control activities carried out by this agency. The Bi-City Health Department has a staff of sixteen plus contracts for nursing services and lab services. The personnel include the Medical Director (Dr. E. Merton Hill), the Director of Environmental Sanitation (Mr. Clifford Bortz), a food sanitation specialist, a public health educator, four sanitarians in Allentown and four in Bethlehem, two secretaries, and two clerks.

Allentown and Bethlehem both have their own health boards. The Bi-City Health Board is made up of members of the other two boards. The Bi-City Health Department has no nurses or laboratory technicians on its staff. There are two private nursing agencies in the area who contract their services to the health department. Similarly, the department contracts for laboratory work with the water works laboratory in both cities.

Funds for the health department are provided by the state and the cities. The state grants the department 75¢ per capita per year. Both cities also provide 75¢ per capita per year for their respective populations. The total budget for 1966 was 288 thousand.[1]

Allentown is a growing city of 100,000. The industries are diversified with numerous small plants. The city is rather clean and neat in appearance and has an unusually large city park system. It is known as a convention city. The city government seems fairly serious about combatting air pollution. For instance, the present city incinerator is overloaded and periodically causes smoke and fly ash problems. The new incinerator plans which city council has approved, call for an extra one million dollars in air pollution control equipment out of a total cost of six million. The Allentown air pollution code sets no specific limits except for smoke (ringleman number two). The code merely forbids emissions which constitute air pollution or an air pollution nuisance. Air pollution is defined as being detrimental to the public health, welfare or safety, or as causing severe annoyance or discomfort, or as causing damage to property, or as interfering with the normal conduct of business. The law does provide for an air pollution board which may promulgate detailed regulations. It says nothing about the cost of abatement.[2]

Bethlehem is a city of about 80,000 which has decreased somewhat in population in recent years. Bethlehem Steel has a huge plant located there which overshadows all other enterprises in the city. This plant also causes the major air pollution in the city. The other significant air pollution problem is the odor and smoke from backyard open incinerators. A very substantial fraction of the homeowners burn trash and garbage in open barrels in their backyards. One of the results, in addition to air pollution, is that rats thrive on the unburned garbage.

Bethlehem, so far as can be determined, is doing almost nothing about air pollution. The city has no air pollution regulations, not even an open burning ordinace. Since Bethlehem Steel is far and away the major pollutor, with the citizen's back yard burning probably running second, there seems to be little point in doing anything about air pollution until Bethlehem Steel controls its emissions. Bethlehem Steel says it is planning to convert at least some of its plant to basic oxygen furnaces which will substantially reduce the pollution output. Just when this will occur is somewhat uncertain.

The Bi-City Health Department serves two contiguous cities which, in terms of air pollution, are worlds apart. The study focused upon Allentown simply because there was no appreciable amount of air pollution control activity in Bethlehem.

The Information Sets in the Air Pollution Control Officer

In this section the sets of items stored in the air pollution control officer are constructed. Three separate and complementary methods were used. First, there are files on 68 separate air pollution emitters, some of whom emit several kinds of pollutants. In these files air pollution problems are classified according to location, complainant, type of pollution, emitter, severity of problem, duration of problem, frequency of problem, and attitude of the emitter regarding abatement. In addition there are reports on air pollution, especially, the one delivered to the Lehigh Valley Problems of Air Pollution Seminar on May 9, 1967.[3] This report discussed, in addition to some of the aforementioned categories, wind and temperature inversion characteristics of the Allentown area.

The second method used was that of interviewing the control officer. Most of the detailed data in the sets is a result of the interviews. The third "method" was observation of the control officer during his daily routine.

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This extensive period of prior observation was very useful in constructing the sets. For instance, there is no way to determine whether the double classification:

I. particulates
  a. lint
  b. soot
  c. dust
II. odors
  a. H_2S
  b. sulfide odor
  c. garbage odors
III. smoke
IV. gases
  a. CO
  b. SO_x
  c. NO_x

or the single classification:

lint
soot
dust
H_2S
sulfide odor
garbage odors
CO
SO_x
NO_x

should be used, except by observing the individual's output. And the classification used determines the amount of information in a message about one of the items.

The results of these three methods (reading files and reports, interviews, and observation of behavior) were used to construct the sets. To a limited extent they provided checks upon each other. For instance, an interview response was that particulates of all the metals are found in the area. However, the files indicate that the various metallic particulates are not distinguished, that there ia a category "metallic particulates" rather than "cadmium particulates, bismuth particulates, iron particulates and so forth". The only rigorous check upon the validity of the sets would be an extended observation of the control officers behavior to determine if he really uses the categories in the sets.

The sets presented here do not cover all messages. They are restricted to messages concerning the job, and of these, only those regarding air pollution are fully subdivided. A complete specification of on the job messages would require that all of the items in the *set - city departments* and in the *set - public health* be subdivided in a fashion similar to that for air pollution. The probabilities listed in some of the sets are primarily for purposes of illustration. These probabilities are based upon comments of the control officer (i.e. "fairly often," "most of the time," "seldom") but should by no means be considered as accurate.

The sets of items for the air pollution control officer follow. Notice that the sets are grouped on *levels*. Level two sets are subdivisions of items in the level one set. Level three sets are subdivisions of items in level two sets. The figure in front of an item (i.e. the 92 in front of "public health" in the first set given) is the probability (expressed as a percent) of a message which refers to that item *if the message refers* to that set at all. Notice that the sum of the probabilities in a given set must add to 100.

Level one - on the job messages

Set - city departments

92 public health matter
0.5 bureau of law
0.5 police
0.5 city planning
0.5 garbage collection and disposal
0.5 fire department
0.5 zoning
0.5 housing
0.5 plumbing
0.5 streets and public improvement
0.5 street cleaning
0.5 civil defense
0.5 sanitary fill
0.5 parks
0.5 playgrounds
0.5 city swimming pools
0.5 sewage department

Level two - public health

Set - public health activities

10 Air pollution
2 Water pollution

2	Solid waste
15	food sanitation
1	swinning pool sanitation
4	insect problems
4	rodent problems
4	pigeon problems
4	weed problems
4	accident prevention
4	occupational health
1	parks and streets cleanup
1	building sanitation
.33	maternity care service
.33	infant care service
.33	well baby clinics
.33	Tuberculosis clinics
.33	venereal disease clinics
.33	orthopedic clinic
.33	innoculations
.33	mental health program
.33	health guidance program
.33	geriatrics program
.33	childrens accident and poisoning program
.33	clinical tests
.5	international travel certificates
.5	newsletter
8	records and files
4	reports to state and federal governments

8 mail

4 conferences

6 budget

9 personnel

Level three - air pollution

Set - kind of pollutant

lint

soot and fly ash

fugitive dust

cement dust

metallic particulates

organic particulates other than soot or fly ash

nitrate particulates

sulfate particulates

H_2S odor

sulfide odor

soot odor

metal odors

organic particle odors

perfume odor

car exhaust odors

tank farm odors

dry cleaning odors

restaurant odors

diesel odors

garbage odors

smoke or other buoyant stack emission

CO

SO_x

NO_x

hydrocarbon gasses

fluorides

aldehydes

methane gas

acid mists

paint mists

Other sets similarly constructed are: location of emitters, damage per homeowner, duration of pollution, concentration of pollutant, ringleman number, size of area affected, frequency of occurrence, political pressure, wind conditions, wind direction, mixing depth, duration of iversion, sources of lint, sources of soot and fly ash, sources of fugitive dust, sources of cement dust, sources of metallic particulates, sources of organic particulates, sources of nitrate particulates, sources of sulfate particulates, sources of H_2S odors, sources of sulfide odors, sources of soot odor, sources of perfume odors, sources of car exhaust odors, sources of tank farm odors, sources of dry cleaning odors, sources of restaurant odors, sources of diesel odors, sources of garbage odors, sources of smoke or other buoyant stack emissions, sources of CO, sources of SO_x, sources of NO_x, sources of hydrocarbon gases, sources of fluorides, sources of aldehydes, sources of ammonia gas, sources of methane gas, sources of acid mists, sources of paint mists, abatement actions for public health nuisance.

The abatement procedure is pretty well defined. After a violation has been detected, the procedure is generally as follows:

meetings with the emitter
notify emitter to abate
ask state for help
survey residents of the area
public hearing
harass emitter
arrest emitter or seek an injunction

Depending upon the situation, one or more of these steps may be repeated or omitted. And, of course, if the problem is abated the procedure then goes no further.

The set of abatement action items is the same for all three kinds of violations. However, the probability of the various items may not be any where near the same for the three kinds of violations. Further, the probability of the items will depend upon what action has been taken previously. Thus a full specification of the sets - abatement actions involves for each of the kinds of violations:

1) a set of probabilities of items before any action is taken.
2) a set of probabilities of items after "meeting with emitter".
3) a set of probabilities of items after "meeting with emitter" and "notify emitter to abate".
4) and so on.

Information sets have been constructed for air pollution control activities. The clerical work involved in using these sets to calculate information flows will be so great that nothing less than a computer system will be feasible to handle it.

It might be helpful to consider some examples. Suppose the secretary relays to the air pollution control officer (APCO) the following information: "A woman called and said that something soils her wash while it is on the line. Her name is Mrs. John Doe and she lives at 570 S. Main St." Let's calculate the information content of this message.[4] The APCO knows that particulates are the prime cause of soiling of wash.

$$I\ (\text{particulates}) = -\log P\ (\text{particulates})$$

Particulates include (see set on page 8) lint, soot and fly ash, fugitive dust, cement dust and particulates of metal, organic matter, nitrates, and sulfates or:

$$\begin{aligned} P\ (\text{particulates}) = {} & P\ (\text{lint}) + P\ (\text{soot}) \\ & + P\ (\text{fugitive dust}) + P\ (\text{cement dust}) \\ & + P\ (\text{metal}) + P\ (\text{organic}) \\ & + P\ (\text{nitrates}) + P\ (\text{sulfates}) \end{aligned}$$

There are 30 different pollutants, all assumed to be equally likely. Thus:

$$P\ (\text{lint}) = \frac{1}{30}\ ;\ P\ (\text{soot}) = \frac{1}{30}\ ;\ \text{and so on}$$

Therefore:

$$\begin{aligned} P\ (\text{particulates}) &= \frac{1}{30} + \frac{1}{30} + \frac{1}{30} + \frac{1}{30} + \frac{1}{30} + \frac{1}{30} + \frac{1}{30} + \frac{1}{30} \\ &= \frac{8}{30} \end{aligned}$$

The information that the pollutant is particulates is:

$$\begin{aligned} I\ (\text{particulates}) &= -\log \frac{8}{30} \\ &= \log \frac{30}{8} \\ &= \log 3.75 \end{aligned}$$

At this point we need a table of logarithms to the base two. These tables are not readily available. Fortunately we can use:

$$\log_2 N = 3.32 \log_{10} N$$

to calculate the logarithm to the base two.

$$I \text{ (particulates)} = \log 3.75 = 3.32 \log_{10} 3.75$$

$$I \text{ (particulates)} = 3.32 \ (.574) \text{ bits}$$

$$= 1.91 \text{ bits}$$

The information in the address can be calculated similarly:

$$I \text{ (location)} = - \log P \text{ (location)}$$

The ladies address specifies a particular block out of 1500.

Therefore:

$$P \text{ (location)} = \frac{1}{1500}$$

$$I \text{ (location)} = - \log \frac{1}{1500}$$

$$= \log 1500$$

$$= 3.32 \log_{10} 1500$$

$$= (3.32) \ (3.176) \text{ bits}$$

$$= 10.52 \text{ bits}$$

$$I \text{ (message)} = I \text{ (particulates)} + I \text{ (location)}$$

$$= 1.91 \text{ bits} + 10.52 \text{ bits}$$

$$= 12.41 \text{ bits}$$

Notice that the message considered above was a "public health" message and an "air pollution" message. We could, of course, calculate the information content of these facts also. However, if we are dealing only with air pollution messages we may wish to neglect this calculation because it will be the same for all messages. How we deal with this will depend upon our purpose.

Some of the sets are empty. An empty set means that the APCO is not aware of any items in the set. This does not necessarily preclude a message which nominates an element that belongs in the set. For instance, suppose that one of the APCO's staff reports that he has discovered a source of fluoride. The information that a source of fluoride exists in the city is:

$$I\ (\text{fluoride source}) = -\log P\ (\text{fluoride source})$$

Since the APCO was unaware of the existence of such a source, the message is subjectively improbable. If the situation was anticipated, the APCO could have been questioned regarding the probability of discovering a fluoride source. If the situation was not anticipated, another approach is needed. Suppose, for instance, a kind of air pollution is discovered that is not included in the set. Intuitively, we would say that such a message carries a lot of information. Within the framework of the analysis so far presented it carries zero information. Perhaps the best solution to this dilemma is to define the "surprise value" of such a message as a measure of its probability. For instance, discovery of a source of fluoride would probably not be too surprising because it would mean either a new industrial process or a previously undetected process. However, discovery of an air pollutant that fit none of the categories in the set - kinds of pollutant would be very unexpected for an experienced APCO.

Suppose a message contained several items that were understandable but not included in any set. Measuring the information in such a message would involve determing which sets the items belong to and the "surprise value" (or probability) of each item.

The fact that the information metric can handle unforeseen messages turns out to be of crucial importance for the theory. Prior to developing this point, the information metric could measure only routine, anticipated messages. The really crucial messages are the unanticipated, novel messages. Routine messages seldom pose a serious threat to an organization's survival nor do they seriously load the organization's computational abilities because routine techniques are developed to handle them. Thus, only if the metric can measure the unexpexted can it illuminate some of the most interesting and important aspects of organizations. It seems likely that this measure will remain somewhat crude. The refinement attainable will be determined only through use and experimentation. However, even an order of magnitude measure will be a welcome tool in this area.

Summary

Sets have been constructed which allow measurement of all routine information regarding air pollution. Rigorous testing of the proposed metric would entail an extended period of sampling communication flows.

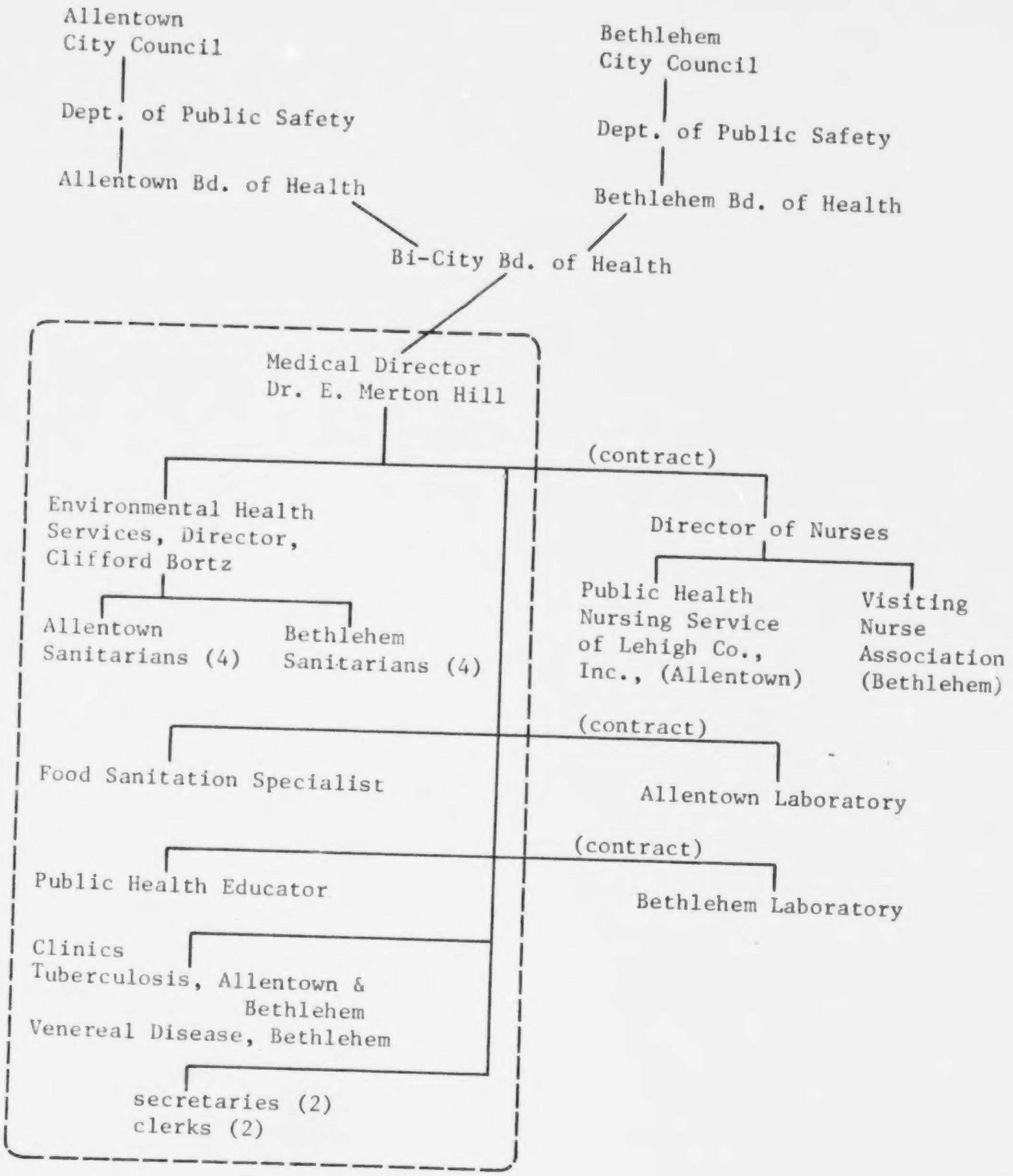
Allentown City Council
Dept. of Public Safety
Allentown Bd. of Health
Bethlehem City Council
Dept. of Public Safety
Bethlehem Bd. of Health
Bi-City Bd. of Health
Medical Director Dr. E. Merton Hill
(contract)
Environmental Health Services, Director, Clifford Bortz
Director of Nurses
Allentown Sanitarians (4)
Bethlehem Sanitarians (4)
Public Health Nursing Service of Lehigh Co., Inc., (Allentown)
Visiting Nurse Association (Bethlehem)
(contract)
Food Sanitation Specialist
Allentown Laboratory
(contract)
Public Health Educator
Bethlehem Laboratory
Clinics
Tuberculosis, Allentown & Bethlehem
Venereal Disease, Bethlehem
secretaries (2)
clerks (2)

Figure 1 The dotted line encloses the Bi-City Health Bureau.

FOOTNOTES

[1] *Bi-City Health Bureau 1966 Report: Annual Report* (Allentown-Bethlehem, Pa.: Bi-City Health Department, 1966); *Report of the Director of the Department of Accounts and Finance of the Public Accounts of the City of Allentown, Pa.* (Allentown, Pa.; Department of Accounts and Finances, 1967); *An Ordinance Making Appropriations to the Several Departments of the City of Allentown: Ordinance No. 11088* (Allentown, Pa.: City Council, Dec. 1966).

[2] *Codified Ordinances of the City of Allentown, Pa.* (Cleveland, Ohio: The Walter H. Drane Co., 1965).

[3] Clifford Bortz, "Air Pollution Problems in the Allentown Area," *Problems of Air Pollution Seminar* (Allentown, Pa.: Unpublished, May9, 1967).

[4] I shall assume that all items in a given set are equally likely unless it is otherwise indicated.

[5] The information quantity in question is:

$$\begin{aligned} I\ (\text{public health}) &= -\log P\ (\text{public health}) \\ &= -\log \frac{92}{100} = \log \frac{100}{92} = \log 1.09 \\ &= 3.32 \log_{10} 1.09 = (3.32)\ (.0374)\ \text{bits} \\ &= 0.124\ \text{bits} \end{aligned}$$

$$\begin{aligned} I\ (\text{air pollution}) &= -\log P\ (\text{air pollution}) \\ &= -\log \frac{10}{100} = \log 10 = 3.32 \log_{10} 10 \\ &= 3.32\ \text{bits} \end{aligned}$$

$$\begin{aligned} I &= I\ (\text{public health}) + I\ (\text{air pollution}) \\ &= 3.32\ \text{bits} + 0.124\ \text{bits} = 3.44\ \text{bits} \end{aligned}$$

The total information we can extract from this message, using our sets, is thus:

$$I\ (\text{total}) = I\ (\text{public health}) + I\ (\text{air pollution})$$

FOOTNOTES (Cont'd)

+ I (particulates) + I (location)
= 0.124 bits + 3.32 bits + 1.91 bits
+ 10.52 bits
= 15.85 bits

APPENDIX 6

Allegheny County Air Pollution Program

Allegheny County Air Pollution Program

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On January 8, 1960, Pennsylvania adopted an Air Pollution Control Act. This law which provided enabling authority for the establishment of a state program to control air pollution excluded established cities or counties from its provisions and made specific mention of the states' policy toward Pittsburgh and Philadelphia. These comments are to be found in section 12 of the act which provides:

> The Provisions of this act shall not apply to any city or county which has an air pollution control agency, except in the case in which a source or suspected source of air pollution exists in such city or county the effects of which extend beyond the boundaries of the city or county concerned. Notwithstanding any other section of this act (including the provisions of Section 2) nothing in this act shall limit the powers conferred under existing laws upon counties of the first and second class to enact and enforce through the counties health Dept. or otherwise ordinances or rules and regulations controlling and regulating air pollution or the emission of smoke.

The act also provided for the establishment of Regions and for Regional Air Pollution Control Association - keeping control as local as possible. Pittsburgh was the headquarters for Region IV.

It is symptomatic of state-county relations that no membership from Allegheny County was required by the state on the Regional Association for Region IV. Relationships (formal and informal) at the administrative level were few. Discussions with state officials operating in that region indicate relations were limited to referring complaints that erroneously made their way to the state health department in Pittsburgh back to the county officials. Of these the state maintained no record.

In February, 1960, the Smoke Abatement Advisory Committee, a group appointed by the County Commisioners to study the problem of smoke control, met with the County Commissioners to discuss the contents of the law which the advisory committee proposed. The advisory committee, which apparently expected quick and favorable response from the county officials, was disappointed as the meeting bogged down with legal points. According to the newspapers the issues were: (1) what to do as far as "grace periods" were concerned; and, (2) how the county was to finance the acquisition of the scientific and technical personnel the act called for.[1]

The reluctant commissioners were informed by the advisory committee that industry had spent millions of dollars on smoke control studies and they felt "its time the county became a partner in this research".[2] Since the law, which was finally accepted, did not require extensive research efforts from the Air Pollution Control Bureau, one may consider that the "legal points" which bogged down the original meeting became less significant

In April 1960 the county unveiled its proposed ordinance to public view. Not surprisingly, the law was quite similar to previous county ordinances in that it was limited to control of smoke and particulates and it provided for formal participation by the advisory committee (who signal the proposal and their private occupation affiliations follow:[3]

C.H. Weaver	Westinghouse electric
P.A. Fleger	Duquesne Light
T.F. Hatch	Graduate School of Public Health University of Pittsburgh
S.M. Jenks	U.S. Steel
C. Moses, Jr.	Not available
M.G. Netting	Not available
L.J. Reese	Pa. Economy League
G.A. Shoemaker	Consolidated Coal Corp.
L.P. Struble	United Barge Line Corp.
E.R. Weidlein, Sr.	Mellon Institute
Joseph Yablonski	U.M.W.A. Pres. Dist. 5

A new feature of the proposed ordinance was the type of grace period it would authorize. This act would provide that programs would be drawn-up and presented to the Board of Health by industrial polluters. Two types of programs were suggested; (1) certain steel equipments - open hearths, sinter plants and electric furnaces could be covered and (2) equipment which had been in compliance with previous ordinances and which, because of the stricter nature of this law, were not in compliance could be covered by a grace period.[4]

The advisory committee, with proposal also suggested several administrative and enforcement techniques which reveal their ideas concerning how the control program should be run.

> Administrative responsibility for the execution of the public phases of the air pollution control programs is vested in a Bureau of Air Pollution Control, functioning within the County Health Department under the supervision of the Director. Qualifications for the Chief, who heads the Bureau, and his subordinates have been outlined, not detailed, in order neither to curb the Commissioners' appointive discretion nor to conflict with the personnel classification system.
>
> Responsibility for private air pollution control programs devolves upon the Air Pollution Control Advisory Committee. (The director of the County Health Department is a member ex-officio of the Committee.) Besides advising the Board of Health upon the development and execution of these rules and regulations assign special research projects to particular groups or industries.[5]

The advisory committee, after suggesting that the smoke bureau be restricted to the "public" phases, goes on to describe its own relations with the "private" polluters.

> Rather than complicating the present proposal with detailed schedules and programs, the Committee will act as the clearing house for plans and time-tables of the various classes of industries for control of emissions from particular processes. These programs will be compiled, coordinated, and recommended, where suitable, by the Advisory Committee and submitted annually to the Board of Health for approval or disapproval. The Advisory Committee will also oversee the implementation of these programs and the research programs to be conducted in fields

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where effective means of controlling air pollution are as yet undiscovered.[6]

Discussing enforcement the advisory committee states:

> The expressed intent and general tenor of these Rules and Regulations concentrate upon the furthering of air pollution control through voluntary cooperation and effort. A vital factor in the success of the air pollution control program, therefore, is the challenge to every citizen and group to exercise strict self-disipline and join with the rest of the community in creating a healthier environment by reducing air pollution.
>
> Nonetheless, the community must be protected against violations of these standards. The proposed document sets forth very explititly the steps by which violators are to be notified; required to correct conditions; granted bearings, if desired; and fined, when necessary. The Director is also authorized to initiate corrective action against emissions of all kinds of air pollution, whether or not specially limited by the Rules and Regulations, whenever the accumulation of pollution is such as to constitute a public nuisance.
>
> Special provisions prevail whenever, in the opinion of the Director, emergency condition imperils public health. The Director is enpowered to act immediately and decisively to meet the emergency.
>
> Another means by which the Director and the Bureau secure adherence to standards is found in their regulatory and licensing functions. The inspection and issuance of permits for new or altered fuel-burning equipment begins with the Bureau's review and approval of plans and specifications for such equipment. Without permits issued then and at subsequent inspections, the equipment may be sealed by the Director. (Sealing may also take place if three or more violations of pollution limitations have taken place within one year.) The Director also licenses solid fuel dealers and ascertains that the fuel to be sold meets the new, more stringent size requirements. In addition, the emission of radioactive matter must be licensed by the Director, who will be governed by relevant State requirements.[7]

Presumably the intent of these enforcement controls is aimed at the "public" phase of the problem. Citizens groups in Allegheny County did not concur with the advisory committee public-private distinction and were very vocal in their objections. One feature of the policy making process which really rankled the "smoke haters" was the brief public discussion that preceded the adoption of the ordinance. Not only was the ordinance a year in preparation - with no "public" participation - but public hearings were only held on one afternoon and individuals were only granted eight minutes to make their points.[8] Objections notwithstanding, the commissioners approved the Board of Health's recommendations and on August 1, 1960 the ordinance became effective.

Before moving on to later developments a look at the Bureau of Air Pollution Control is necessary. Several questions spring out of the presentation so far: (1) what happened to county personnel after 1957 when the City of Pittsburgh and the county's smoke abatement groups were merged; (2) what happened to the organization when the county people came into the health department?

Interviews with county smoke bureau personnel who were in the old county bureau during the crisis with industry report a general loss of faith in the county. In addition, they indicated that the field personnel lost interest in reporting violations. From available data it does not seem as if any legal actions have been initiated since 1957.

No other information indicated that the nature of the problem itself had profound effects on the county personnel. The essence of the pollution problem in the county is the extreme visibility of the polluters. How can a "control" agency in full awareness that it has failed to exert its will on the major problem, resume normal operations? By 1960, over 90 per cent of the homes in Allegheny County used natural gas for heating. Also the railroads, by that time, were almost totally diesilized. The ideology of control in Pittsburgh had always been geared to solving the smoke and dirt problem; to be more specific to solving the coal problem. The explanation of this paper is that the effort in 1957 to confront the industrial polluters was an attempt to give meaning to the control effort.

Seen in this light it is likely that polluters should not adopt self-policing tactics in so far as these tactics preclude the duly authorized government agencies from feeling a sense of accomplishment in the steel control program. Otherwise occasional outbursts of manhood are bound to occur.

The second point is the effect on the smoke control organization in 1959 when the county personnel were merged in the County bureau with the personnel from the city bureau. The personnel from the city perceived themselves on having been successful in their program activities prior to merger. Also since they remained in the health department their organization was essentially intact. The analgamation was not smooth. A major problem concerned differences in technical expertise. The nine expert county employees were in a position to take control of the organization. In October, 1966, two of the top five positions are filled by employees of the old county bureau. The rest of these positions (top 5) were filled by newcomers - people unaffiliated with either of the old bureaus. It is significant that in only one case are there remaining employees of the old county bureau supervised by a former city bureau the employee (in 1966 about 1/3 of the organization's personnel were from old city bureau). To further complicate the situation, the former city employees became the nucleus of the field service program. It appears that the "downtown" administrative functions were, in the main, controlled by former county personnel and the field services were dominated by city employees.

Shortly after the merger in 1959, the acting director, the former assistant chief in the city bureau, resigned and took a position with a steel firm in Buffalo, N.Y. He was replaced by a County employee who had headed the county's Environmental Health Bureau.[9] This move completed the merger.

In 1961 the County Board of Health approved the programs permitted in the 1960 ordinance. The steel industry was granted a 10 year "grace period" and other industries (cement, power) were granted grace periods of shorter durations.[10]

The striking features of the programs are their informality and their unenforceability. The steel program provides that the industry as a whole will meet an annual compliance schedule eventually ending in full compliance in 1971. There is no document describing details of this arrangement nor providing minimum standards for individual plants. As long as the industry as a whole complies, the individual plants or companies are beyond the ordinance. However, this arrangement is logical if one accepts the public-private dichotomy put forth by the advisory committee. In addition, in so far as the programs are concerned, the industries are in compliance.

A major event affecting the Bureau of Air Pollution Control was a decentralization which occurred in 1962. This move could be looked on as the formalization of the field service-administration fracture which occurred with the merger of the two bureaus. The health department was already organized into five health districts so this move was not overwhelming. Apparently the intentions of the decision makers was to accomplish better understanding between the inspectors and the local district health officials. The mutual benefits of the decentralization and earlier trials are described in the following quarter from the Health departments proposal:

> In September 1960, the first attempt was made toward decentralization by the placing of an Air Pollution Inspector under the immediate supervision of the Environmental Health Administrator of the Southwest District Office with the Bureau retaining responsibility for the technical direction of the service. In January 1961, and Air Pollution Inspector was stationed in the Southeast District Office. This experience

> has only been partially successful due to change in Health Officer and Environmental Health Administrator in the Southwest District. However, it did accomplish a better understanding on the part of the Air Pollution Inspector of the Health Department's program, particularly in environmental health. It provided a better understanding on the part of the District's environmental health staff of the air pollution control interests and, to a limited degree, it helped to identify the District Office to the local municipal officials in relation to air pollution control. This was particularly true in Kennedy Township and the Greater Pittsburgh Airport where special problems of open burning exist.
>
> On January 1, 1962, the Air Pollution Inspectors' districts were changed to coincide with the boundary lines of the five Health Districts. This was necessary even in the Southwest and Southeast Districts because the field staff assignments were not the same as the Health Districts' boundary lines.[11]

Whatever the intentions of the decentralizers, the results were significant. The inspectors began operating in isolation from the central bureau. The complaints which arose from the public would frequently go directly to the inspector at the field office and "command control" over his behavior was dependent on his filing a report of his daily activities. The disposition of these reports in the health departments bureau of biostatistics made any real controls impossible.

In the atmosphere of cooperation ushered in 1960 the inspectors were given broad discretionary powers. "Little" grace periods were summarily issued and the emphasis appears to have been on "working things out." No prosecutions were generated.

It is very difficult to put the events which occured between 1959 and 1965 into perspective. The major problems were out of the hands of the bureau. Steel and the other big industrial polluters were tending to their own problems and open burning was still politically unsoluable. The "Renaisance" was over for smoke control and little was heard from organizations such as the Allegheny Conference for Community Development.

The general lack of objective combined with the tension of the merger was sufficient to reduce the "control" agency to a very low level of activity and also perhaps explains the apparent lack of desire of the central agency officials to closely direct the behavior of field personnel.

In 1965, Allegheny County received a federal grant under the Clean Air Act of 1963. The grant was of the improvement type and was to be effective from April 1, 1965 through March 31, 1968. Since Allegheny County is comprised of 129 civil subdivisions, it qualified for the intermunicipal grant - and was able to command 3-1 matching rather than the 2-1 matching available to single municipalities.

Allegheny County's proposal to the Public Health Service included three phases of action to be jointed under the federal project. These are:

1. A comprehensive air pollution survey plan.
2. A continuous air monitoring plan.
3. Auxilliary necessities, public relations, and auditing[12]

Phase I, the air pollution survey, was the major portion of the proposal. It was to last 33 months and to involve a systematic survey of pollution levels in the county. The immediate objective was to determine the air pollution level and distribution throughout the county. The long-range objective was to extend and improve the present air quality control operations and levels.[13]

TYPE	METHOD	OBSERVATION INTERVAL	NUMBER
SO_2	Lead Candle	30 days	74
Fine Particulate	AISI	30 days	17
Wind	Observer	Hourly	3
Pollen	Microscope	Daily, May to October	2
Ozone	Rubber	30 days	1
Corrosion	Spring	30 days	1
Wind	Automatic	Continuous	3
Dustfall	Can	30 days	1*
High Volume	Staplex	24 hours	30
SO_2	Davis	Continuous	2
CO	MSA	Continuous	4
Continuous	Special	Continuous	1
			1

Phase 2, the continuous monitoring plan, consisted of the establishment and operation of a station to place Allegheny County in the "nationwide" "CAMP PROJECT". This phase has been implemented and the station is located in downtown Pittsburgh atop the health department offices on the City-County building.

Phase 3, auxillary necessities, is most significant with respect to the development of an audit division. There is nothing in the proposal which details the audit divisions duties, nor which explains the need for one. However, their certainly has been the development of a financial control organization within the Bureau of Air Pollution Control. The financial complications of the federal grant have been sufficient to require the full time participation of several bureau personnel.

The budget problems or tension points that help explain the need for a special division to "bird dog" the federal grant start right off in the county's program proposal. The clean Air Act provisions must maintain a certain level of expenditures exclusive of the federal grant.[14]

The year preceding the grant is considered the base year. Allegheny County's proposal states that its expenditure for 1964 (the base year) were $157,263.00. The report of the County Controller for 1964, on the other hand, shows that warrants for$191,625.98 were drawn against the accounts of the Bureau of Air Pollution Control. The difference is explained by the rather loose accounting procedures in which salaries were paid to non-air pollution control personnel and budgeted to the Bureau of Air Pollution Control. Another complication here is that the bulk of the salaries went to health inspectors (non-supervisory, "first Job" positions) operating in the "decentralized" health department regions.

The Bureau of Air Pollution Control was put into the position of maintaining records of personnel being paid under its salary accounts in order to accurately determine air Pollution control expenditures. Again in 1965, the Report of the County Controller shows the county's air pollution expenditures to be over$196,000. Again salaries were paid to non-air pollution control employees.

In the latter part of 1965 or early 1966, the director of the Bureau of Air Pollution Control and the Director of the Health Department "tightened" the organization to preclude paying non-APC personnel from APC funds. The 1966 Controllers report reveals that the county's expenditures for APC had retreated to$191,150.04, and this with the grant now in full swing.

The result of the federal grant on local decentralization, therefore, was disastrous. It can be seen that the new financial tightening that the federal grant required would increase central anxiety about the activities of field personnel and hence, reduce the local health officer in charge of the field headquarters discretion as it applied to resource allocation. Little is written aobut the impact of grants on local central-field relations. It is possible that if the local region were large enough or sufficiently diverse the centralizing features of federal accountability requirements could make program administration impossible.

It must also be remembered at this point that central-field relations in the county suffered from the city-county complex which matured in the 1962 "decentralization". The new relations between central and field personnel led to the appointment of a new inspector-supervisor, the man directly responsible for coordinating and supervising the air pollution inspectors. The former incumbent inspector-supervisor, who is particularly critical in city-county comparisons, and who was a city employee, was shifted to plans and permits where he operates without assistants and in apparent seclusion.

In addition to the early problems of keeping track of salaries the finance section was required to account for their separate funds:

(1) The program exclusive of the project.

(2) The non-federal (matching) funds.

(3) The federal funds.

The county financial machinery, exclusive of the health department, provides no device for discerning the matching funds from the rest of the county's expenditures. As far as the county is concerned administration of the fund - since it does not attempt to participate - remains solely a health department task.

The health department, though it maintains several accountants in its Bureau of Administrative Services also plays little part in the administration of the funds. The thought occurs that since there are a number of special projects administered by health department bureaus that a greater integration of these activities would free bureau personnel, for tasks more attuned to their specialties. In discussing the matter of a more systematic program approach to these different projects with health department accounting personnel, the most significant reason for the present approach appears as the technical nature of the programs. Only someone well versed in air pollution control equipment and practices is seen to be capable to deal with the Public Health Service. The technical nature of the projects is complicated by their multiplicity. Interviewees report insufficient staff to cope with the diverse reports.

Probably the most significant feature of the air pollution control program grant, is the lack of rules and objectives imposed by the Public Health Service. In the absence of rather definite ground rules it is difficult to go beyond the personal relationship, and this explains more than any other factor the apparent inability of the health department to integrate these functions.

In addition to non-concurrent fiscal periods, and to the lack of ground rules administrators of the grant was complicated by the county's purchasing system. Three features of this system stand out:

1. Purchasing may only occur from the time the budget is approved in March or April until October.
2. Though budget authorization is given additional authorization must be given by the commissioners for expenditures in excess of $1,000.00.
3. It is slow.

The county has traditionally spent over 90 per cent of its monies for air pollution control for personnel. The bureau expenditures for equipment have changed radically since the county received the federal grant. In the period from the beginning of the grant, March 31, 1967 , the bureau spent more for equipment than it had in the rest of its history. In their second annual report of expenditures the county reported spending $71,361.77 for equipment.

How much has the county's budget been altered by the grant? There are several ways of attempting to measure this. On one hand the researcher could measure the changes in the perscentages of the amounts budgeted to various categories under the air pollution control heading. The county's report does not distinguish between matching funds and "regular" county program funds so the controlling report should reveal whether or not the grant has forced the county to a different man-machine ratio. As there is only one year, 1966, to use this method is premature. Another technique which could be employed to determine budget distortion might be to calculate decreased growth rates for other programs which compete for resources. Though no attempt has been made to execute such a study it can be seen that to do it requires that the researcher assume the system is drum-tight as far as resources are concerned and therefore contains no easily shifted matching fat.

Whatever the implications and earliness notwithstanding the county has matched in its traditional manner. Over $52,000 of the county's total matching funds of $72,000 were budgeted to personnel, through the second year of the grant.

The federal grant program took off slowly in the county. In its first year of operation only $2546.17 of federal money was spent, and all this in the last quarter of the grant fiscal year. Administrative changes in the Bureau of Air Pollution Control are cited as the prime causes for the delay.

Though the first year under the grant saw little expenditure of federal funds, a number of decisions were reached which could have far reaching effect for Air Pollution Control in the county. The major administrative change which led to a review and reappraisal of the program was the resignation of the bureau chief and the appointment of E.L. Stockton to direct the bureau's activities effective September 19, 1965. Pursuant to the reappraisal the following changes were made:

1. The comprehensive air monitoring survey outlined above was discontinued in favor of an automated data collection system.
2. The air pollution chemistry laboratory which had been located at the Arsenal Health Center was integrated and relocated with the Health departments Public Health Laboratory at its Forbes Street location.
3. The administrative staff of the bureau, with the sole exception of the bureau chief, was moved to the Arsenal Health Center in order to provide better supervision of field activities and coordination with the five health districts.

1. Pittsburgh Press, "County Going Slow on Adopting New Smoke Control Law" February 2, 1960, p. 1.

2. Ibid., p. 1.

3. Report of the Air Pollution Control Advisory Committee presented to Allegheny County Health Department in 1959. (publication is undated) Contains recommended control ordinance proposed for 1960.

4. Ibid., p. 9.

5. Ibid., p. 2.

6. Ibid., p. 2.

7. Ibid., p. 5.

8. Pittsburgh Press, "Citizens Group Rehuffed on Smoke Curbs," July 10, 1959, p. 2.

9. Pittsburgh Press, "Dunsmore Takes Over as Smoke Control Chief" July 17, 1960.

10. Pittsburgh Press, "Steel Pledges to Halt Smoke," May 11, 1961, p. 1.

11. Allegheny County Bureau of Air Pollution Control, Decentralization of Certain of the Field Services in Air Pollution Control, unpublished report dated December 7, 1962.

12. Allegheny County's Application for Federal Grant 65A4104RI, p. 5.

13. Ibid., p. 6.

14. Charles D. Yaffe, "Air Pollution Control Program Grants - the First Year of Experience" The Journal of the Air Pollution Control Association (September, 1965) p. 403.

The Impact of Program Grants on Air Pollution Control in Philadelphia

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In the rise of the federal-city relationship, the grant-in-aid "has affected the practice of federalism as profoundly as any other single factor."[1] This phenomenon has grown from the depression years into what is now a complex pattern of public health grants which include more specific program-area financial aids than those in any other field. There are basically three forms which these grants to local units may take: grants-in-aid, loans and repayable advances, and shared revenues. Grants-in-aid, or direct financial assistance, may also be of one of many forms: outright gifts, matching grants, conditional grants, in lieu payments, loan formulas or cash grants to individuals.

The impact of these funds on the administering orgainizations, including the Pennsylvania Department of Health, was studied in 1954-1955 by the United States Commission on Intergovernmental Relations.[2] It was found that the Commonwealth spent most of the money for Commonwealth programs rather than distributing the funds to local administration. Nevertheless, the federal funds, a very small portion of the total State funds, had very little impact on general state administration. However, the Pennsylvania Department of Health did "segragate funds, personnel, and activities affected by Federal regulations from those where only State standards prevail." In this instance, the federal standards were more stringent than Commonwealth standards in a few specific administrative areas such as the personnel merit system and the health activity performance standards.

Other potential impact areas were also evaluated. Some of the conclusions were: (1) professional or "federal" loyalities of state personnel did tend to develop in federally assisted programs; (2) no effort was made to coordinate the various state-federal programs although there were no federal restrictions present to hamper this; (3) federal grants affected the Governor's role by restricting patronage, shaping state policy, and by offering to him the opportunity for partisan advantage in using federal money; and (4) local governments (including Philadelphia) welcomed the grants in opposition to the attitudes of state officials who thought that grants given directly to local units would greatly hinder state (or state-wide) control.[3]

The Federal Clean Air Act and its amendments has given great impetus to state and local programs in air pollution control. This, of course, was the basic purpose of the act: to aid in the establishment and improvement of state and local programs, not to provide programs or funds substituting those of state and local governments. (Section 101). The grant to Philadelphia was justified under Section 9(b) of the Act which states that one agency eligible for grants is: "A city, county, or other local government health authority,... charged with responsibility for enforcing ordinances or laws relating to the prevention and control of air pollution,...."

Technical assistance to local units has been an important aspect of federal aids for control. To date, fourteen states and three communities have received long-term assistance for air pollution control. Also, thirty cities including Philadelphia have received this form of aid for short-term (less than one year) studies and assistance. Five interjurisdictional areas are receiving continuous assistance under a variety of circumstances.

Although legislative assistance encompasses all aspects of air pollution law, this activity, to date, has been primarily concerned with ordinance establishment and information dissemination.

The final form of aid is that of training personnel in the various aspects of air pollution prevention and control. Graduate level training programs, individual fellowship and training grants, and short-term courses for people already practicing in the air pollution field. Although the Philadelphia has experienced all of the aid forms outlined above, the most important of these is of course the financial grant, the "Program Grant."

Table 1 illustrates the monetary impact of this grant. The grant was for the improvement of the total program; therefore, federal funds were only available for the expanded program over and above the total 1964 City expenditure.

Thus, the 1967 federal funds ($223,312) actually surpass the total city funds ($178,302) spent in 1964. The impact of this additional money can most easily be seen by examining what this money has basically bought, equipment, personnel, and supplies.

Although the Environmental Health Laboratory until 1964 offered a number of services to the Air Pollution Control Section, these services were maintained by utilizing equipment that was originally purchased for other purposes within the Division of Environmental Health. From Table 1, it can be seen that the first year of the grant emphasized the purchase of necessary equipment; in fact, almost half of the grant funds was spent on this component. Air and stack sampling devices, essential items for an adequate program, were purchased thereby complementing the chemical and physical analysis equipment slready available to the Section. The Laboratory now spends more than seventy-five per cent of its resources (time, money, etc.) on air pollution control programs.

The other major capital investment was in radio-patrol automobiles to be used for compliance inspections. The previous city allowances for equipment purchases (less than $7,000 per annum) were inadequate. Because the city was unwilling to provide for these necessary expenditures, it can be stated that an adequate control program could only be established with the use of additional (non-city) funds. The city was unwilling to make expenditures for major equipment purchases, but the federal government did allow for these purposes.

In the Air Pollution Control Section, there are thirty-one professional positions with only twenty presently being filled; there are also four clerical positions with three being filled. In the laboratory, thirteen out of the fourteen positions are filled and the one clerical position and the one custodial position are filled. From Table 2 it is apparent that federal funds not only had an impact on the increased number of personnel but also on the personnel structure itself. However, because many of the alloted positions are not filled, the potential impact on this important sector has not been fully realized. In sum, there has been a net increase of twenty-six positions since the advent of the grant; fifteen of these slots are filled and eleven remain vacant.

The functions, activities, and purposes of the section have not significantly changed, but the additions of personnel and equipment resulting from the grant have at least changed the activity level. Although the personnel structure has shifted to compliance inspection (because of the larger increases shown in the first seven position classifications in table 2), this shift resulted from a section decision rather than a federal decision. Thus, it can be said that the primary impact of federal money was to raise activity levels in areas that the city saw fit. For example, in the past twelve months public complaint case have increased thirty-five per cent, total investigations have increased 148 per cent, and fines resulting from all enforcement actions have risen by 300 per cent.

Other supporting activities such as air sampling or engineering consulting have also increased significantly since the establishment of the grant. Without probing further, this paper's thesis is that activity levels have increased because of the increased availability and utilization of resources resulting directly from the federal grants. Since the institution of the grant, annual compliance actions have risen more than 600 per cent - from approximately 550 actions in 1964 to approximately 3,280 projected for 1967.

The grant has had other effects on the administration of the program. The most obvious one is that all programs included in the grant, or project, must be limited to the amount of funds and time imposed on the city by the federal government. The broad improvement project of Philadelphia and the new maintance grant program starting in 1968 do not, however, severly alter new or existing control programs. The unobligated funds remaining in 1965 and 1966 were due to the persistent vacancies incurred in the personnel system and not to the non-implementation of plans because of a time constraint.

Additionally, because federal grant support may begin at any time and that project revisions are permitted at any time, Philadelphia was able to tailor its grant support to its specific time need, the city's fiscal year, and specific program objectives. Thus, the federal grant imposes no more constraints on the system than city fiscal and budgetary policy does - both funding systems have starting dates on January 1 and extend for the calendar year.

However, grant funds may only be used for the "direct costs specifically incurred in the conduct" of the specified project for which the grant was given. The section has, for illustration, spent some earmarked equipment money on personnel expenses incurred because of the project; this is permitted as long as project money stays within project expenses. According to the grants manual any transfers among direct cost categories may be made by the section without federal approval except:

1. Where the cumulative increase to the transfer category is more than $1,000 or twenty-five per cent of the total category funds, whichever is the larger;

2. When transfered funds are to be used in a category for which no federal funds were initially budgeted;

3. When the transfer would "reflect a significant change in the character or scope of the project;"

4. When funds would be increased for: tuition, alterations or repairs in excess of two hundred and fifty dollars, foreign travel, or publications; or

5. When a purchase of equipment not specifically mentioned in the application exceed $1,000 cost.

Although a delay from thirty to sixty days would probably be incurred by the need for federal approvals, the necessity for such transfers has not been experienced by Philadelphia to date.

In a review of direct cost categories, it is obvious that no severe limitations are imposed upon air pollution section. Over the long-run, personnel is perhaps the most important cost variable; and, there are a number of secondary but nevertheless important limitations enumerated by the federal government. The first is that salary levels of project employees may be set by the grantee provided that no monetary differential exists among federally funded and city funded employees, and that project funds may only be used for salaries in proportion to the time consumed on the project. In Philadelphia, annual salaries begin at: $7,600 for public health engineers, $6,000 for chemists, and $5,000 for technicians. Because salaries and other personnel constraints are imposed by the city's civil service system, the low salary argument for poor recruitment is not directed toward federal policy constraints although minimum federal salary standards would perhaps prove beneficial in the future. It should also be noted that salaries for supporting personnel such as budget officers, administrative specialists, personnel officers are not included in the actual project agreement and, therefore, are considered to be indirect costs. Indirect costs must be financed solely by the city.

The other regulations imposed by the grant did not have any significant recognizable effect on the Philadelphia program, but for future reference, if necessary, regulations cover the following topics: alternations and renovations of the physical plant, bonus payments, books and periodicals purchases, communication costs, contingency funds, contractual services, depreciation, dues to professional organizations, entertainment costs, insurance costs, maintenance and repairs of equipment, publication costs and reservations, recruitment, rental of equipment, taxes, transportation, and tuition.

Although all of the factors mentioned throughout this paper have some signifigance, the major positive factor of the grant has been to insure that the local agency follows a systematic approach to the total problem.

To be eligible for a project grant, the local agency must have an approved "Workable Program." This is a thorough statement of the agency's objectives with the supporting means enumerated which will achieve these objectives. The Philadelphia objective, as previously stated, is to lower the pollution level so that its effects on health and property will be neither significantly or irreprably harmful.

From a source inventory taken 1958, it was also determined that a regional approach, of an unspecified nature, would be needed to solve the interjurisdictional problems associated with air pollution. In general terms, a crude system analysis of the problem had to be presented so that the proper allocation of resources could be determined.

Although the Philadelphia program was not planned to be changed signigicantly, the existing 1964 program did have to be defended by the "Workable Program;" and to do this the following activities had to be undertaken before the application could be submitted.

1. A collection and evaluation of data had to be assembled and presented which included: air quality and meterological data; source estimates; data concerning the effects of certain pollutants; and the cost and feasibility of control techniques necessary to meet the program objective.

2. A brief legal analysis had to be made, thereby determining that the control agency had enforcement authority adequate to carry out the program.

3. An analysis of training needs had to be made. This of course required a thorough analysis of the Section's personnel plans.

4. A complete control program had to be examined and evaluated in terms of reducing the air pollution potential. Measures providing for interjurisdictional coordination were initiated. Air Quality and emission standards were promulgated. Time limitation studies had to be made concerning "hard-core" problem areas, functional and geographical. The permit system had to be expanded and simultaneously evaluated. Suggestion systems for urban planning for pollution control had to be established with other city agencies. The present internal research system had to be evaluated in terms of what technical assistance might be beneficial in the near future. And, a public information system had to be founded.

In sum, a very detailed description of present and future functions had to be produced. This, of course, consumed much agency time preceding the actual application. But, this federal imposition did insure that a reasonable approach to control would be made: the systems, or air resources management, approach to air pollution control. Although specific bits of information are lacking concerning the above operations that were undertaken, the above activities were completed before the application was submitted to the Division of Air Pollution.

If the actual program would have been altered because of this requirement, a detailed discussion would be necessary. However, the program did not change significantly so that the actual administrative impact is found only in alterations in then (1964) existing activity levels. The specific activity increases, nevertheless, were due to internal policy decisions and did not reflect the will of federal authorities. No "model" program was ever instituted by the federal government - technical planning assistance was done on a piece-meal basis at the express request of the city. The major impact is that the federal government, The Division of Air Pollution's grants program representatives, approved the city program on face value without any substantive alteration.

The resultant activity changes, therefore, we're dependent upon specific Philadelphia problems and available personnel. Furthermore, these contigencies have eventually resulted in an increase in enforcement actions (the only figure which can be accurately quantified) by a factor of ten since 1963.

There are, however, a number of activities which have been directly affected by the administration of the grant itself. These activities are somewhat arbitrarily termed "administrative" activities or services. These are activities which do not directly try to reduce pollution by enforcement means. The only other activities recognized are "program" activities or services. These activities are enforcement activities, compulsory or non-compulsory. The former are supporting activities such as: personnel administration, budget operations, supply and purchasing activities. The later category would include such activities as: engineering or consulting services, compliance inspections and complaint investigations. These later activities have increased because of internal decisions and federal money. The "administrative" activities have been altered because of internal decisions, federal funds, and federal restrictions and regulations.

The most significant administrative impact is found in budgeting and fiscal operations. This is primarily because of the detailed accounting requirements specified. These are summarized as follows:

(1) Separate fund accounts by project must be maintained with separate accountability of all specific receipts, expenditures, and balances. Separate enumeration and control by budget categories (personnel, equipment, etc.) must also be maintained. Because the city budget does not

distinguish among the Department of Public Health's programs, two sets of books (one city and one federal) must be kept by the department. Also, the city maintains different budget categories than those presented in the discussion concerning federal grant budgets:

Federal Categories	City Categories
1. Personnel	100 Personnel Services
2. Equipment	200 Purchasing
3. Supplies	300 Materials & Supply
4. Travel	400 Equipment
5. Other	

Although there is no need for a more specific comparison, these differences do affect the amount of resources used in the budgetary process. Presently one of the budgets must be modified from the other depending upon which is "marked-up" (approved) first. Since both must be approved, the one approved first has to be used as the guide; this, of course, also assures consistancy in the reporting of both. However, in January 1968 the city plans to adopt program budgeting so that the city will have greater program control via the budget. Because each city program will have its separate budget, both the federal and the city budget for air pollution will contain exactly the same information although labeling may still remain different. Thus, unnecessary duplication of efforts and additional "grantee" efforts will be minimized, thereby saving man-hour resources in the fiscal offices.

(2) Specific documentation (vouchers, receipts, and similar items) as required for: all major expenditures of the air pollution control program (non-project spending included) and of all salaries charged to the grant including all supporting records of "fringe" benefit charges such as retirement, insurances, etc.

(3) Any other charges made against the grant must be documented - this includes such items as travel and supplies.

Other than those guidelines specified above, there are no other accounting requirements. With the exception of the program and categorical differences, the city and federal requirements coinside. Thus, other than duplicating records, these initial impositions have had virtually no effect on program or activity levels of the section especially because the fiscal office is not a part of the air pollution control section. If grant funds can be accounted for as specified in the approved grant application, and this has always been the case, no federal-municipal conflicts should arise in this functional area.

To insure that any potential conflicts will be rectified near the point of impact, the federal government requires that expenditure reports be filed by the section (or the financial office) every three months, the last one of the fiscal year being an annual expenditure report. The fundamental function of these periodic reports is serving as a check for both governments to assure all that funds are being appropriated for proper items at the most beneficial point in time. From time to time, although one has not been conducted for Philadelphia to date, fiscal audits will be made of the project grant by Department of Health, Education, and Welfare auditors. This, basically, serves the same purpose as the reports. Upon completion and federal expenditure approval of the audit, the section may dispose of the grant's financial records.

Because these federal requirements are not considered severe by local personnel, it can be accurately stated that the grant has not created any major hardships for the grantee. Since Philadelphia, although not historically considered as "progressive," has established many more standard operating procedures than required by the federal government, it is not believed from the results of this paper that grant requirements will influence the city in accepting or rejecting future grants which carry similar requirements.

This Study Compared With Former Studies.

In the past, some studies found that a great number of administrative difficulties resulted from federal grant impositions on local units, both public and private. The paramount summation of all major studies made during the 1945 - 1955 period was the report issued by the United States Commission on Intergovernmental Relations.[4]

Other than those expressed difficulties encountered in the necessity for very detailed financial reporting and management as previously discussed in this section, the 1955 findings appear to be no longer relevent. The significance of these differences may have never been realized previously because no additional studies have been completed since the Commission's 1955 study. Both studies are dealing with complete project or program federal grants specifically in the public health sector involving direct federal-local relations.

The differences of opinions between local and federal officials, as the 1955 Commission stated, were exemplified by reports of conflicts on program policy.[5] Recently, in Philadelphia, this author found a different case: (1) the Philadelphia program was not altered because of federal influence and (2) of the "federal" services examined in this paper, none appeared to cause any conflicts among the two governmental groups concerning program policy.

Another difficulty found by the Commission in 1955 was that project grants imposed so many restrictions (audits were specifically mentioned) that local programs became inflexible - the programs could not respond to new interium problems. Again, these restrictions were recently found to have no program or activity impact.

Additionally, there were seven specific administrative difficulties found with the project grant system in 1955:[7]

1. In 1955 it was improbable that local officials could get clean-cut decisions from federal officials in regional offices; the local enquiry eventually had to go to Washington. This, perhaps, is still the case, but as an administrative problem it appears to have disappeared. It is certainly no more difficult for a Philadelphia - Washington communication net to function than it would be for a Philadelphia - Regional network to function. Furthermore, communication channels such as the federal telecommunications service, which provides unlimited service for a set fee to federal agencies, have eliminated the high cost communication factor.

2. The mayor-dominated Advisory Committee also stated that new federal-city programs resulted in the bypassing of cities "general administrative and budgetary control" on a program, and that federal-municipal "verticle functional autocracies" have been created.[8] In any specialized program area, this "technocrat" relationship, as President Eisenhower warned in his final address as Chief Executive, can evolve; in air pollution control, a definite city-federal relationship has indeed sprung up. The city is dependent upon federal research, data collection, and many other services.

Because of the matching formula of grants-in-aid, Philadelphia administrative mechanisms still set the policy and operating formulas. The federal government matches the city funds and not the other way around as many may assume. And, because this paper has shown that the "administrative" requirements associated with the grant do not have a significant effect on program administration, it can be said that the 1955 statements would be gross over-statements of a number of minor problems.

3. "So-called stimulating grants turn out, at times, to be not aids but real burdens, pushing the local governments ... into areas which ... are not ready for local support,"[9] was a basic charge levied in 1955. If air pollution today was not an urban problem, this statement would be true; but, air pollution is a problem in Philadelphia and the city, dating from at least 1954, decided it was ready to give support.

4. Continuing with their admittedly impressionistic attack, the Committee opined that "strings attached" to these specialized programs resulted in the taking away of local political control.[10] Air pollution control, to this author's knowledge, has never been a significant local issue. There are no patronage appointments available in this highly specialized program. The program itself does not appear in the Mayor's Operating Budget. As stated previously, the city administration supported the grant program and began receiving grants at the beginning of the first full fiscal year after effectuation of the Clean Air Act of December 1963.

5. Furthermore, it was believed twelve years ago that federal grants-in-aid force up the local salary levels.[11] As the committee failed to do, this paper can not present data in support or rejection of that thesis. City salaries have risen, but other related increases include: other (industrial, educational, etc.) salary levels, the cost of living, and so forth. Thus, this situation may or may not be true. However, city salary levels, covering the entire civil service, have risen since the introduction

of the air pollution control grant including a pending across the board increase of approximately eight per cent.

6. "Dislocation or distortion" of local services by diverting local funds to those activities for which federal aid is conditionally available was another problem encountered by the 1955 group. This was found to be "particularly true in the case of health and welfare grants."[12] Of course, this seems logical when considering the scarce resources which are available to local units. However, because the Philadelphia budget is not one of program allocation but one of Department allocation, no generalizations supporting the 1955 findings can be drawn without a very thorough examination of the entire fiscal structure. Budgetary decisions are the responsibility of the city council and records are not kept concerning why a certain program receives more funds.

This paper has shown that air pollution control funds have increased in a higher proportion than the remaining public health aggregate, but the reasons for this, as previously explained, are hypothetical. The 1955 observation certainly has merit as a hypothesis, but no evidence was given then nor now in support or rejection of the statement. Dislocation or distortion relative to all urban services, therefore, has not been measured at this time.

7. The final problems discussed by the Committee concerned federal-city administrative conflicts other than those discussed above. This paper has shown that there have, of course, been many isolated instances of administrative policy conflict: a question concerning travel funds for the fiscal officer; problems associated with where to locate three air monitoring devices; and so forth. However, program director and Public Health Service grants chief both indicated that: (1) no significant conflicts have arisen,

and (2) both parties believe that the federal government, as the intent of the law states, should encourage and supplement local programs, not replace them. Both individuals seemed to be satisfied with the Philadelphia program and indicated that no significant conflicts, of any nature, have arisen.

Table 1. The Philadelphia Grant History, 1964 to 1967.

1964 - Total funds were $178,302: this is all "city" money and is later termed the "base" amount by the federal grant.

1965 - First year of grant.

100% City funds (base):

personnel	$151,813
equipment	6,744
supplies	3,371
travel	224
other	16,130
Total	178,302

Expanded Program (Improvement Grant):

Item	Federal	Non-Federal	Total
personnel	$35,276	17,638	52,914
equipment	47,211	23,605	70,816
supplies	3,123	1,562	4,685
travel	663	331	995
other	8,806	4,403	13,209
Total	95,079	47,540	142,619

unobligated federal funds = $29,583
unobligated non-federal = 14,791
Total unobligated = 44,375

Composite Brief:

total budget	$365,296
total federal funds	124,662
total spending	320,921
total federal spending	95,079
increased spending from 1964	+142,619

or approximately (depending upon the cost of living and payroll changes in Philadelphia) an increase of +80%.

1966:

City Base:

personnel	$158,143
equipment	000
supplies	2,503
travel	1,001
other	16,665
Total	178,302

Expanded Program:

Item	Federal	Non-federal	Total
personnel	$65,130	32,564	97,691
equipment	36,605	18,302	54,907
supply	10,786	5,384	16,153
travel	3,271	1,636	4,907
other	9,536	4,768	14,304
Total	125,307	62,654	187,968

unobligated federal funds = $47,029
unobligated non-federal = 23,514
Total unobligated = 70,543

Composite Brief:

total budget.....................$436,813
total federal funds.............. 172,336
total spending................... 366,270
total federal spending........... 125,307
increased spending from 1964...... 187,968
or approximately 106%
increased spending from 1965...... 45,349
or approximately 14%

1967: (Actual spending figures will not be available until March, 1968.)

Composite Brief:

city base budget.................$178,302
city expanded budget.............. 111,656
federal contribution (expanded)... 223,312
(total expanded.................. 334,968)
total budget..................... 513,000
pending supplemental grant (federal)67,278
(not specifically included as part of present grant)
increased budget from 1964........$334,968 or +180%
increased budget from 1965........ 147,004 or + 80%
increased budget from 1966........ 76,187 or + 40%

Table 2. The Impact on Personnel - Personnel Structure Development Under the Federal Grant.

Available Positions in 1964	Available Positions 1965	Available Positions 1966	Available Positions 1967	Total Full Positions
Engineer #(3)	8	9	11	9
Control Engineer =(0)	1	1	1	0
Inspector =(10)	11	11	16	9
Sanitarian =(1)	1	1	1	1
Epidemiologist =(1)	1	1	1	0
Enforcement Officer (0)	1	1	1	0
Clerical (5)	6	6	6	5
Laboratory Engineer (4)	4	4	4	4
Instrument Specialist (0)	1	1	1	1
Chemist (1)	4	5	5	5
Laboratory Technician (0)	2	2	2	2
Student Trainee (0)	0	2	2	2
Total Positions (25)	39	43	51	37
Additional Positions	14	4/18	8/26	

NOTES

1. Roscoe C. Martin. *The Cities and the Federal System*, (New York: Atherton Press, 1965), 111.

2. John H. Ferguson and Charles F. LeeDecker. *A Survey Report on the Impact of Federal Grants in Aid on the Structure and Function of State and Local Governments: Pennsylvania.* (U.S. Commission on Intergovernmental Relations, 1955).

3. Ibid., 332-348.

4. U.S. Commission on Intergovernmental Relations. *A Study Commission Report on Federal Aid to Public Health* (Washington Government Printing Office, 1955).

5. *Ibid.*, 1-3.

6. *Ibid.*, 3-22.

7. *Ibid.*, 21-29.

8. *Ibid.*, 7.

9. *Ibid.*

10. *Ibid.*, 21.

11. *Ibid.*

12. *Ibid.*, 21-22.

APPENDIX 8

Lehigh Valley Air Pollution Control District

8-1

Lehigh Valley Air Pollution Control District

by

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State and local governments have long recognized the existance of air pollution. Concern about this environmental resource is reflected by the existence of various laws directed toward the control of air pollution. Although the regulations set standards and prohibit the disposal of effluents into the atmosphere, acceptable emission levels often are difficult to attain. At the local level of government, fragmented organizational arrangements and limited financial resources can impede the abatement of air pollution problems. Individual communities acting alone commonly do not have the capabilities to provide comprehensive treatment for a problem that usually encompasses a wide geographical area.

The study was undertaken to describe a structural arrangement that small local governments can institute in Pennsylvania to contend with an air pollution problem that extends beyond individual political boundaries. The inquiry provided data about significant aspects of the program and revealed some of the necessary requirements for establishing a joint program operation at the local level of government.

Intergovernmental cooperation is a practical way for municipalities to provide services and deal with common problems. Without losing their corporate identities local governments can attain some degree of coordination in the performance of their designated activities. Functional integration achieved in this way has popular appeal because it is noncompulsory, and the governments may cooperate on one object or goal but not agree on others. Local officials and administrators decide in each instance the conditions under which they will agree to establish a mutual relationship.

An interjurisdictional air pollution control program established through the cooperation of a number of municipalities was chosen for analysis. The study reviews the factors that occasioned the establishment of the arrangement and examines the major elements in the solution. Among the items included in the analysis are the organizational, administrative and financial considerations affecting the problem.

The Lehigh Valley Air Pollution Control District was legally established on July 1, 1957 when the ordinances were enacted by two nearby municipalities. A long range program of cooperation was instituted with each municipality taking independent action. Similar air pollution ordinances were adopted by the two participating communities, and a voluntary association was formed for administering the program within their respective jurisdictions. Subsequently other governmental jurisdictions entered the program, and at the present time there are eleven cooperating boroughs and townships located in two counties.

Impetus to establish the program grew from citizen dissatisfaction with a long-standing and seemingly interminable problem indigenous to the area since the start of the cement industry during the middle of the nineteenth century. Located in the southeastern portion of Pennsylvania, the affected communities comprise the Lehigh Valley cement belt, which extends for twenty-five miles and includes approximately seventy-five square miles.

Residents of the area in the past had been disposed to tolerate excessive dustfall as an industrial by-product, accepting it in return for the economic well-being that accrued to the area because of the employment, taxes and other advantages contributed by the cement companies.

The efforts of these interested citizens in conjunction with support by the municipal councils in Northampton and Nazareth boroughs over a ten year period culminated in the establishment of a formal organization consigned, as its primary task, to seek abatement of the cement dust problem. When additional municipalities entered the program, the scope of the organization's activities increased to accomodate the diverse problems extant in those areas.

The program is a small scale operation with two full time employees, a director who is a professional engineer and a secretary to assist him. The director, appointed as the chief air pollution control officer for each community, enforces the individual municipal ordinances. In carrying out the terms of the agreement, he has the responsibility of coping with technical problems and formulating a program of compliance. His activities are diverse and include: (1) on site inspecting of pollution producing equipment; (2) inspecting and approving plans for installing, contructing, or altering equipment; (3) permit certification for operating equipment; (4) conducting air sampling procedures; (5) investigating complaints; (6) conducting particle analysis; (7) participating in education and scientific activities related to air pollution technology; and (8) disseminating information to the public.

In each municipality there are citizen air pollution control boards, consisting of five members appointed by the elected representatives. They, along with the municipal officials, oversee the administration of the program within their own territory. Periodic meetings are held with the director to discuss progress that is made and consider difficulties that arise from time to time. Independent action is taken within individual municipalities, and before the director pursues any major course of action, he confers with the municipal officials and the board members. Their consent is needed before enforcement procedures can be instituted. At times joint meetings of elected officials and board members are held between municipalities to evaluate matters pertinent to their common interests.

Public funds are allocated to finance the program. Service charges are levied on participating governments according to an established formula, based on population, assessed valuation, and the number of major industrial plants.

Two criteria can be used for evaluating the effectiveness of this program. The first is the expenditures of major offending industrial plants for dust control equipment, and the second is the amount of dustfall in the communities in the area. Since the program began, the principal industrial plants have expended 20 million dollars for air pollution control equipment. Before this phase of the program can be judged complete, expenditures of approximately 25 million dollars will have been made. According to the second factor, surveys have indicated a steady decline in the annual dustfall within the areal jurisdiction of the program. When air pollution control was first instituted, there was an average yearly dustfall of approximately 3,600 tons/sq. mi/mo., but the dustfall rate now occurring has been reduced to approximately 600 tons/sq. mi/mo. (See enclosed charts.)

ANNUAL DUSTFALL SURVEY AVERAGES
L.V. PORTLAND CEMENT COMMUNITIES

Tons Per Sq. Mile Per Month

	Cementon	Copley	Egypt	Pullerton	Hok	Nazareth	Northampton	Stockertown	Wescoe* ville
1958	---	---	290	---	---	101.0	201.0	---	---
1959	---	101.0	106.0	11.0	29.0	48.0	123.0	59.0	---
1960	---	92.7	65.0	17.9	38.3	43.2	98.0	67.1	---
1961	---	83.4	51.7	14.2	26.9	47.5	81.0	34.0	---
1962	110.5	113.3	59.1	20.3	36.3	44.1	87.3	21.5	---
1963	91.2	111.0	47.7	15.6	32.4	42.2	61.6	27.7	---
1964	84,9	74.2	48.3	14.9	23.6	22.4	64.8	21.1	---
1965	80.0	62.6	52.2	19.5	26.2	35.4	81.6	34.9	16.5
1966	88.2	69.2**	60.2	14.2	37.6	27.3	85.2	32.0	9.0

* Wescosville joined LVAPC on Jan. 1, 1965 due to community pollution problems.

** The gauge which was located on the roof of the Washington School was discontinued after the July measurement due to a risky ladder to the roof and the presence of excessive pigeon droppings which are known to be a health hazard. The average shown is for the first 7 months.

Remarks: In 1957 when LVAPC was established, there were 93 rotary kilns in operation in 16 cement plants having an annual capacity of 39,000,000 barrels. At the end of 1966 there were 55 rotary kilns in operation having an annual capacity of 30,674,000 barrels while cement production was about 24,000,000 barrels. Of the 12 Portland cement manufacturing plants remaining, 6 are equipped with mechanical or electrostatic dust separating devices for cleaning kiln stack gases which do not consistently operate at high performance levels experiencing frequent malfunction which results in accessively heavy dustfalls. Of the 6 plants there is reasonable assurance that 2 plants will come within compliance standards by the end of 1967. The remaining 4 plants present economic problems which will require more time to comply or may bring on the alternate decision to discontinue operations.

LEHIGH VALLEY AIR POLLUTION CONTROL
Northampton, Penna. 18076
August 8, 1967

LEGHIGH VALLEY PORTLAND CEMENT REGION DATA

Cement Co. & Location	Type Plant	No. of Rotary Kilns	Length	Waste Heat Boilers or Preheaters	Kiln Dust Collectors	Estimated Efficiency
Coplay	Dry	2	125'	Grudex Preheater	Small Dia. multiple cyclones	90%
Coplay		1	200'	Grudex Preheater	Fiberglas Filter Unit	99+%
Dragon Northampton	Dry	4	323'	None	4 Fiberglas Filter Units	99+%
Giant	Dry	7	125'	None	None	None
Egypt		1	143'	None	Fiberglas Filter Unit	99+%
Hercules Stockertwn.	Dry	3	280' x 12	Chain Sections	3 Fiberglas Fabric Filter Units	99+%
Keystone Bath	Wet	1*	540' x 17 x 15	7,500 b.p.d.	Research-Cottrell	98%
		1	350'	None	Western Precipitator	99%
Lehigh	Dry	1	125'	Humboldt Prehtr.		
Forgelsv.		9	125'	None	Electrostatic	98%
Lone Star Nazareth	Dry	4	300'	None	4 Electrostatics	97%
National	Wet	2	360'	None	Multiclones 24"	
Brodhead		1	340'	None	Multiclones 24"	75%
Nazareth	Dry	7	120'	Waste Heat	Mechanical Cyclones	90%
Nazareth		1	150'	Humboldt Prehtr.	1 Fiberglas Filter	99+%

* New Modern Kiln scheduled to begin operation Nov. 4, 1966
** 4 - 250 ft. Kilns will be dismantled.

Cement Co. & Location	Type Plant	No. of Rotary Kilns	Length	Waste Heat Boilers or Preheaters	Kiln Dust Collectors	Estimated Efficiency
Penn-Dixie #4 Nazareth	Dry	4	140'	Waste Heat	All gases cleaned in 2 fiberglas filter units, 2 Kilns for each unit.	99+%
U. Atlas Northampton	Wet	4	250'	Waste Heat	2 Electrostatics for 3 kilns	90%
				One gray kiln	1 Fiberglas Filter Unit	99+%
				White cement kiln	1/2 Fiberglas Filter Unit	99+%
Whitehall Cementon	Dry	2	150'	Fuller-Humboldt Preheater	1 - Electrostatic 1 - Fiberglas Filter U.	90% 99+%

Small local governments are capable of responding to urgent needs such as air pollution by using existing governmental machinery. Through cooperation municipalities can provide a framework for dealing with a common problem that is beyond their individual capabilities.

To be practical for air pollution abatement, an organizational unit should encompass the major pollution sources within a particular area. Effective administration of an air pollution control program requires the management of a number of elements, and this can be achieved only when most of the pollution sources are entegrated into a comprehensive program.

Instituting a separate air pollution control agency provides a central, visible, and identifiable authority for air pollution control. It is necessary to establish an agency that is comprehensive , flexible, and financially stable. The agency officials also should have direct access to the governmental political leaders.

The type of organizational unit needed to conduct an air pollution control program will depend upon prevailing circumstances. There is no single pattern suitable for all problems and circumstances. A factor more important is having an organization capable of responding to existing needs. With the active support of elected officials, a one man operation can be effective in dealing with air pollution problems, and it may be able to do more than a larger organization that lacks public and political understanding.

In the Lehigh Valley action was facilitated by having a definite target that was immediately recognizable by the community at large. At the present time the main goal is approximately 75% complete. The remaining 25% involves significant economic matters which are difficult to surmount.

Administration of the program emphasizes persuasion and conciliation and encouragement in using the latest anti-pollution devices. Enforcement powers are retained, for the most part, in reserve.

APPENDIX 9

Politics of Resource use in Local Government Policy and Programs

POLITICS OF RESOURCE USE IN LOCAL GOVERNMENT POLICY AND PROGRAMS

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Introduction---Perhaps there was a time in our history where an examination of "the politics of resource use in local government policy and programs" might have been a manageable topic. That time is past. Certainly since the mid 1930's it has been increasingly difficult to discuss local government programs and policies without including the effect of federal policy and programs. It has always been difficult to talk about the subject without including the role of the state government.

Recent studies of intergovernmental relations show that although local governments were the main providers of governmental services in our post Revolutionary period, their actions were often impinged upon by state and national actions. There was the early national legislation setting the boundaries of township areas and setting the criteria for admitting new states. There were also the national and state involvement in building "national roads", canals and railroads, the national policies aiding "infant" industries and the programs setting up a system of land grant research and educational institutions. All of these had a great impact on local governments [10, 14, 15].

Other scholars have traced the effect of social forces on federal policy, programs and administration and observed the impact of this change on local government programs and policies [although not always observed in this order]. One of the earliest and most important of these forces was the effect of "Jacksonian Democracy" whereby the government at the federal level was "commonized" somewhat in the same way that the bureaucracies of some of the developing nations have been "nativized" after independence. Side effects of this process in the United States was the complete fragmentation of governmental authority that led both to the increased importance of political parties and unfortunately, in some cases, to corruption [26, 27]. Since the turn of the century and perhaps as a reaction to Jacksonian principles, there has been a trend to the concentration of political authority in the hands of the executive [4, 7, 18, 24, 33]. Concurrently, there has been an increased importance placed on "scientific management" and more recently "management science" that has compounded the effects of the current trend towards greater executive importance and effectiveness [2, 3, 23, 29, 33].

Community Power ---It must not be forgotten that there are many studies that emphasized the role of the non-public decision-maker in the determination of resource use at the local level. Since Karl Marx there has been a great emphasis on tracing the effect of land ownership, capital ownership and the concentration of other forms of wealth on the determination of public policies and of the total social condition of the area studied. Early anthropological-like studies of U.S. communities reaffirmed the importance of the owners and managers in the determination of local conditions of life [19].

Before 1950, the technique of community study involved a team of observers for a year or more of full time study. More recently, the technique of "community power structure" has allowed a researcher to isolate the important decision-makers of a community in a very short time.

One of the consequences of this technique has been the publication of a relatively large number of studies allowing the comparison of findings. For the purposes of this paper the most important of these is that the local government officials are not influential in the determination of local area resources. It is the owners or managers of the commercial, industrial or banking concerns, singly or in concert, who make the important decisions affecting the use of local resources. [16, 21, 32].

There are those who object to community power structure studies on two grounds, one methodological, the other theoretical. The critics state that this theory, which may be characterized as "tight", assumes that all resources affecting policy decisions, and therefore programs, are completely controlled or owned by a few persons. The pluralist theory assumes that local systems are "slack", that is, the number of possible activities or programs in a community could absorb a far greater amount of energy than are currently applied to them. It is concluded, therefore, that there are policy areas where the application of time, energy, intelligence or money by any actor, manager, citizen or public official, will result in a measurable effect in the direction provided by the actor. This theory is not necessarily in conflict with the other, for the owners or managers have many more resources at their disposal than the modal citizen and therefore can have a greater effect on policies. However, it does modify it to the extent that any citizen, regardless of his position in the economic system, is admitted to have a capacity for affecting events. [9].

The differences are as yet unresolved although there appears to be a movement towards an accomodation of the two standpoints. It remains true at this time that the findings of these studies are seriously biased by the methodology used and by the professional training of the researcher [33].

Regardless, there does seem to be an area of common agreement. For example, southern localities are more likely to have a monolithic power structure, as are areas where industry and commerce are locally owned and where social integration is high [34].

Finally, admitting that private interest were the important determiners of policy in the past, one can see the trend toward a greater involvement by local governments. Merely by the comparison, for example, of the policies and programs of a local government in the mid 19th century with those of a similar government in the mid 20th century , it is evident that very few local natural resources were affected by the government's action then as compared to now. The increased number, density, heterogeneity and expectations of the people has led to a great increase in the number of services provided by local governments and in the level of quality of the service [17, 28].

Summarizing the above, we may say, then, that any evaluation or statements about the politics of resource use at the local governmental level is very hazardous. Generalizations from the past are difficult since the role that local government has played has changed while at the same time the scope of its programs have increased greatly. Most important, the inter-relationships among the governments at each level of our federal system and among the governments at each level are so varied, complex and new, that any sort of generalization is dangerous.

Number and Kind of Government---We are confronted by a problem of definition at the same time. What are these local governments we are talking about? Or, put another way, are these institutions that we call governments sufficiently alike that we can make generalized statements about them. Will a statement about New York City hold for Pittsburgh, Chicago or Los Angeles?

Will it hold for Wilkes-Barre, Fort Wayne and Tucson? Will it hold for Woonsocket, Vicksburg, and Coeur d' Alene? Will it hold for Sough Kingston, Milroy and Eloy? The question concerns definitions of the terms corporate and quasi-corporate, urban and rural, large and small, old and new, eastern and western; and even of whether the entity we are talking about is a unit of government at all. We have not faced the question as to whether to include counties, special districts and school districts in our evaluation or only multi-purpose governments or to include single purpose governments. The latter is especially important since special district governments are growing most rapidly in number and school districts spend most of the local tax money.

A final problem should be noted? There are, according to certain definitions, and including all kinds of local governments, about 90,000 units in the United States [Table 1]. There have been few comparative studies.

TABLE 1--NUMBER OF LOCAL GOVERNMENTS IN THE UNITED STATES BY KIND OF GOVERNMENT, 1962[a]

Counties	3,043
Municipalities	17,997
Township and Towns	17,144
School Districts	34,678
Special Districts	18,323
TOTAL	91,185

---

[a] Adapted from the U.S. Bureau of Census. Census of Local Government. Washington: Government Printing Office, 1962.

There are a great number of studies of government policies and programs related to resource use. Only a few of these have tried to look systematically at large numbers of governments to reach generalizations about the effects of politics on resource use at the local governmental level [12, 13].

Land Use Planning---Since all of the effects of the politics on resource use is beyound the scope of this paper, the main concern will be with two areas that have been considered by many to be important tools for the management of resources by local governments and the effect of politics upon these.

The first to be considered is that of land use planning within our governments. As reported by the Municipal Year Book, 1961 nearly all of the 1,180 cities reporting with populations of 10,000 or more persons have planning comissions. Of these 398 had their own planning director while 799 reported expenditures over $1,000. Only 49 of the cities between 10,000 and 25,000 population had full time directors and only 311 of them had expenditures over $1,000. As reported in 1963, 89% (1,211) of the 1,355 cities reporting had zoning inspections. [31].

Unfortunately it is difficult to get any accurate figures about the smaller governments in the Unites States. However, the experience in Pennsylvania, although unable to be extrapolated to the whole nation would certainly be an indicator of the probable condition. In Pennsylvania, the smaller and more rural the government the less likely it will have any ordinances, the less likely it will have staff, the less likely it will have a planning commission.

Persons concerned with the planning process often are startled when they learn how little is necessary to determine the use of land. Once the main arterial roads are laid out and some decisions are made about the size of the blocks (some of these decisions often dominated by the topography of the area), it would seem that other land use decisions are set within quite narrow bounds [6, 22]. Yet for most of our places of over 10,000 population these decisions and many others that set the basic character of land-use were made long before there were public planning bodies. The decisions on land use in these areas revolve about very few square acres as compared to the total area under their legal jurisdiction. A few blocks of the downtown area, the placement of a new shopping center or the improvement of a major arterial road are their most important decisions. These are extremely important but they do not determine the character of land use in the area.

Another observation to be made is that planning, in the past at least, seems to have been instituted in those areas where the land use patterns had been set and the areas were more or less developed. In the governments where these patterns were not as well set, there seems to have been an absence of official plans. Since zoning laws have been useful in freezing the character of an area and stabilizing land values, one could conclude that this technique is adopted by investors to protect their property. Open areas have been kept free from controls in order for these, perhaps, same investors to have the greatest opportunity to opt for the land use that would maximize thier gains [20, 25].

The theory of land use planning states that it should be a process whereby the members of the community can rationally find out what they want in the future then adopt the governmental policies that would lead to those community goals. It includes the idea that the"plan" is a continuous, changing thing made so by reviewing past events and continual re-evaluation of goals.

Case Study I.---The following account is a summary of how the planning process was seen by a professional political scientist in the Twin Cities area. The total area, the states, of concern to the land use plan was a "little more than one-fifth of the Twin Cities metropolitan area. The estimates of future conditions on which the plan was based were, unavoidable, extremely shaky." As far as citizen discussion and participation was concerned it was not "based on a systematic study of articulated fears and desires," nor was there any public discussion during the process; therefore, there was no way for goals or priorities to be set [1, p. 33].

The objectives of the plan, the author continues, seems to have been:

(1) to make the city a safe place in which to own property, primarily by stabilizing existing land-use patterns;

(2) to reduce the tax burden on current residents by new land uses that would pay more in taxes than they would consume in services;

(3) to enable people to go about their daily business more conveniently;

(4) to offer residents more fresh air, outdoor recreations space, and physical safety from accident and disease; and

(5) to make the city more pleasant to look at (for the lovers of neatness and domesticated greenery). [1, p. 33].

According to planning theory this document should have been adopted as a formal plan of action by the political leadership and subjected to constant review. Instead "few political or civic leaders paid any attention to the plan" [1, p. 34]. Some reasons the author thought important for the lack of interest in changing the existing zoning ordinance, for example, were that the political leaders wished to keep their ability to zone without criteria, and that many land owners or dealers liked the existing situation where variances were easily obtained. The reason for the latter was that "the value of their land depended frequently on speculation about its possible future uses" [1, p. 35].

This is perhaps an extreme case and, as a matter of fact, the study does contain a number of strong objections of its conclusions by one of the St. Paul planners. Nevertheless, there are other works that support many of the conclusions of this study as well as of related land-use planning techniques such as urban renewal and redevelopment. [20, 25].

Capital Improvements Budget---Another technique widely proposed for controlling resources at the local governmental level is that of capital improvement budgeting. Again there are few figures on its use but as an example of its possible diffusion consider the fact that of the over 100 units of government above 10,000 population in Pennsylvania, only the City of Philadelphia uses it as an integral part of its total fiscal planning program. It would be surprising if more than a small fraction of the more than 2,400 municipal units of government under 10,000 population in Pennsylvania used the technique.

Case Study II.---A study by another political scientist, again of one city experience, throws some light of what could be expected of this technique if it were more widely used [5].

Overall the experience of Philadelphia with capital budgeting is seen to have been satisfactory. One aim of the technique is to set down the capital projects that are needed to be accomplished by the public sector and to determine the priorities for these projects. A financial plan is proposed to attain these goals. One of the important rationales of capital improvements budgeting is attaining stability in the municipality's fiscal program.

As far as the latter point is concerned the authors record that there is "considerable instability (that is, lack of predictability) in Philadelphia's capital programs." Their conclusion is based on the fact that "instability is endemic in democratic politics and review by the legislative body" [5, p. 219]. The technique envisions developments in terms of five and ten year periods, administrators and legislators are forced by their roles within a pluralistic democratic process to bargain and to produce short term results that enhance reelection. The capital budget is useful to them since it provides them with policy alternatives and their costs; however, to the detriment of stability, the system seems to encourage a great deal of "switching" of alternatives and a tendency to prefer a large number of small projects to a small number of large projects [5, Chp. IX].

Summary.---Being unable to survey the whole process of local politics as it affects the use of resources, two quite different situations have been summarized. In the case of land use planning the problem seems to be that the process that seeks orderly use of the land resources is, at this time, too isolated from the political process.

The most common administrative arrangement in the U.S. is for the planning staff to be responsible to a lay commission that is more less independent of local political forces. There is a tendency for the membership of the commission to be drawn from a particular social strata. Critics of the arrangement have noted that since the commission members are not politically responsible to the people they tend not to be responsive. This tendency is often amplified by the value system of their professional staff who are more likely to be interested in the attitudes of their peers for their comprehensive plan than to the desires of the local citizens. The result is that their plans are unused and for all their efforts the area is "planless".

The problem of capital program budgeting is the reverse. Since it is so eminently a part of the governmental process and judged to be quite successful in operation, the day to day workings of politics distorts its originally proposed functions. The nature of the political process which demands success, flexibility and visibility of programs to insure reelection are forces that work against the stability (a reason often stated for not placing the planning function within the regular government administration).

Conclusion.---Resources other than land that exist within the limits of our local governments are those of water and air. Any evaluation of the policies of local government concerning the uses of the resources for the enjoyment of the population does end with the conclusion that not enough has been done. Nearly everywhere the local governments, as many other segments of the community, have been important pollutors of the water and air and have not been effective in promoting the general welfare [8, 11]. There has long been misuse of natural resources in terms of the recent concern for conservation.

It is a moot point as to the amount of waste that was necessary to attain the rate of development and to maintain the style of life that was desired in the past. The recent discussions about the use and misuse of natural resources is based on the idea that the United States has reached a "mature" stage of development. Although it is true that many of our resources are being depleted while others exist in large quantities, and are in danger of being polluted (at a current, unexacceptable, level of palatability or aesthetics), others still exist in an underdeveloped state, it may be difficult to demonstrate the maturity of development. From recent accounts it does seem as if the value system that lingers from the past tends to undervalue conservation.

Politics as a Process is neither good nor bad. It is a method by which diverse interests may reach an accomodation or where coalitions may be formed to gain more or less limited ends. Those who view politics as being a system whereby the "bad guys" are in control may be condemning the process because they are neither strong enough nor able enough to promote the values they hold.

Unfortunately, increasing the awareness of the electorate or bringing in groups not currently engaged in politics does not always lead to the better use of the local resources. Those individuals or groups may not be so concerned with "clean air" or "clean water" as they are with jobs, social equality or freedom of individual expression.

As Robert Dahl has maintained, in a slack pluralistic system the amount of resources applied in terms of money, energy, time and talent, and the efficiency with which they are used, determines a person's or group's impact on local political events [9]. This may mean, for example, that if we work hard to have ambient air quality criteria accepted, others may have the specific standards set lower than we think is a desirable level of "pureness." But that is the nature of the game.

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Manpower Policies in Selected Air Pollution Control Agencies

Selected personnel practices of air pollution control agencies in three urban areas of various sizes and in a state agency are examined. The analysis emphasizes the consequences of these personnel policies for each of the governments.

Recent federal legislation increasing the funds available for air pollution control program grants has renewed interest in the problems of air polluton manpower needs. Since the 1965 amendments to the Clear Air Act, program grants have been available for state and local programs. Partly through local efforts and partly as a result of federal grants, state and local agencies are being created; and existing programs are being enlarged and refurnished. Total expenditures in 1966 for local, regional, and state programs were 20 million, while the number of programs has risen from 117 to 170 from 1963 to 1966. In 1960 research funds from all sources, industrial, governmental, and university amounted to about eleven million dollars — the figure was 30 million in 1966, and it is estimated to be 70 million by 1970.

Manpower Needs and Estimates

According to the USPHS estimates there were 1200 trained persons engaged in air pollution activities in 1965 while an estimated 7000 trained persons were needed.[1] The gap between needed personnel and actual persons in air pollution control is predicted to increase. According to present trends there will be about 1500 trained persons in governmental air pollution control programs in 1970,[2] while an estimated 7500 will be needed.[3] These estimates are supported by the 1962 report of the Committee on Environmental Health Problems which estimated that an additional 4000 specially trained persons would be needed in the air pollution field by 1970.[4] The air pollution control manpower gap is part of a serious national shortage of Administrative, Professional, and Technical (APT) personnel in state and local governments. This shortage has been aggravated, according to the Municipal Manpower Commission, by the personnel practices of the governments, by the fragmentation of governments, and by inadequate training programs.[5]

These reports are from one to five years old and it is possible that conditions have changed. Figures on rising local, state, and federal expenditures tend to support the statement that conditions are changing and that some progress is being made in attracting qualified persons into the air pollution control field. The task of this paper is to try to determine whether or not current personnel policies of air pollution agencies, specifically, their recruitment, classification, and pay plans are helping them to maintain a competent work force.

Effects of personnel policies on manpower shortages It is apparent that poor personnel programs were partially to blame for the manpower shortage in air pollution control programs. A survey conducted in 1960 by Morton Sterling indicates the scarcity of air pollution control personnel and the ill-effects weak personnel programs have on manpower procurement. In the Sterling survey 36 of 66 city agencies, responding to an inquiry on the availability of professional and technical personnel, reported difficulty in obtaining qualified personnel for their agency. Of 15 county-districts contacted, six had difficulty in procuring qualified technical and professional people. Some of the reasons listed (i.e., insufficient salaries, restrictive residence requirement, lack of advancement possibilities) are reflections on the condition of personnel policies of those governments (Table I).[6]

Table I Reasons for Difficulty in Hiring Personnel in City and County Air Pollution Control Agencies, Sterling Survey, 1962[a]

	City Agencies	County Agencies
Lack of technically trained personnel available	16	4
Insufficient salary	27	5
Lack of sufficient advancement possibilities	2	2
Restrictive residence requirements	4	—
Other reasons	8	—

[a] Taken from: Morton Sterling, "Administration of Local Air Pollution Control Programs," *J. of APCA*, 12, 534 (Nov. 1962).

Four Case Studies

In order to get an estimate of how and what is being done in the effort to attract and hold air pollution personnel, case studies of four governmental units concerned with air pollution control were undertaken. These four units were: a large metropolitan core city with an air pollution section in its department of health; a much smaller core city with a population less than 100 000 persons, whose air pollution activities are part of an intergovernmental health agency; a large metropolitan county with a bureau of air pollution in the county's health department; and a section of a state department of health that operates as that state's primary agency of air pollution control.

Case I Metro City

Metro city, a core city of a large eastern metropolitan area, has a population over one million persons and is a major commercial and industrial center. The city has a strong-mayor

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10-2

form of government and a home rule charter giving it great flexibility in dealing with local political problems.

There is a jurisdiction-wide civil service commission with responsibility for administering the city's personnel system. In addition, the commission does some general publicity for open positions. Each agency within the government has its own personnel section that has the immediate responsibility for classifying positions, keeping records, and advertising for specific positions. This city's civil service agency has a good reputation in terms of impartial competence and innovation.

Almost without exception, employes must live within the city within one year of appointment (that is, waivers of the residence requirement are rarely granted). Most of the positions in the air pollution control agency require a college degree and there is an extensive written entrance examination. Salaries are not competitive, especially for those positions requiring specialized training or experience. This agency has, in the past, lost a number of its engineering staff to nongovernmental employers. It is operating at the present time with a large number of vacancies, and the work load is increasing. There is the expectation that there will be a partial solution to the problem of recruitment when an eight per cent across-the-board increase in compensation takes effect next fiscal year.

Case II Medium City

Medium city is situated in a metropolitan area whose central core consists of more than one political unit. Although not a "twin" city, Medium City is one of the central cities rather than a suburb and has a population under 100 000 persons. The total metropolitan area population is over 300 000 persons. The geographical proximity of the two large central cities in this metropolitan area has led to a good deal of intergovernmental cooperation, although the core cities have governments controlled by different political parties. As a result of this cooperation, Medium City's air pollution control effort is part of a joint-city health department. The bi-city health department has not replaced the health agencies of the two cities; it has supplemented them. Each city has its own health agency wherein certain employes work for the bi-city bureau while others work only for the individual city's health department. One man, the medical director, does have authority over all health employes.

The operation of the personnel program, for the most part, is located in the office of administration directly responsible to Medium City's mayor. The office of administration and the various departments are responsible for recruitment, which includes official visits to schools and colleges, posted announcements, and personal contacts. No effort is made to keep in continued contact with sources of manpower, nor is any effort made to "sell city employment" to prospective employes. Recruitment is done on the basis of immediate need.

Entrance requirements vary with each position, class, and department. In the health bureau all positions, except clerical, require a college degree or, in the case of a nurse, a state license. In addition, residence is required for all employes, as in the case of Metro City. Salary levels are formulated on the basis of job requirements, prevailing wages, and funds available.

Case III Urban County

Urban County has a total population of nearly two million persons with a central city of over 500 000 persons. The county government is responsible for air pollution control for the whole county area including the central city. The air pollution control program is located in a division of the county's department of health and has a good over-all reputation. The personnel system is comprised of the county commissioners, the county's bureau of personnel classification, and the relevant agency administrators. There is no separate civil service commission. Pay plans are within the jurisdiction of the county's salary board.

There is a significant lack of turnover in the air pollution agency. Several employes came to the agency because of a personal desire to remain in the area. Some employes have retired from other jobs and accepted positions open at the "top" in the air pollution bureau.

County salary scales, especially in the "middle positions," are not competitive. It is significant that most vacancies are in beginning engineer and analyst positions; positions that are critical for building a career service.

Case IV Urban State

The state selected for the study comprises one of the major population and industrial areas of the United States. Although not one of the early leaders in the development of air pollution control programs, it has made a respectable effort in the recent past and has been important in the development of ambient air criteria measurement techniques. Except for a few major urban centers, the state is the enforcement agency for air pollution control. It operates with an air pollution commission partly composed of appointees of the governor and partly of *ex officio* members from state agencies concerned with pollution. The technical support for the commission is a division of air pollution in the state's department of health.

Table II Number of Vacancies in the Four Air Pollution Control Agencies

Agency	Total Employed	Number of Vacancies	Kinds of Vacancies
Metro City	26	13	Chief, assistant chief, engineers (5) statistician, inspectors (5)
Medium City	12	3	Sanitarians (air pollution control inspectors)
Urban County	29	5	Engineers (2), analysts (3)
Urban State	31	2	Engineers

All APT positions (engineer, chemist, meteorologist, and administrators) require; (1) a college degree, (2) residence (except engineer I), (3) a written and oral examination. If deemed necessary any one of these stipulations can be substituted or waivered (e.g., the college degree can be substituted by equivalent experience; residency can be waivered; and a person can be hired on a provisional basis before he takes the examination). In the case of being hired previous to examination, the individual must pass the exam the next time it is offered. Promotions are based on academic degrees, experience, and examination — to this point all positions above the entering positions have been filled by promotion.

Summary and Conclusions

All of the agencies, except the state agency, were operating with about 25% of their authorized positions vacant. In the case of the Metro City this is a temporarily inflated figure, since about one-half of the current vacancies are newly authorized positions as the result of increased city monies and federal grants. Other vacancies in this agency are of long standing, and it remains to be seen whether, without changes in the availability of personnel or changes in the manpower policies, the larger number of positions will be more readily filled (Table II).

10-3

Table III Comparisons of Central Tendency Salaries in Metro City, Medium City, Urban County, and Urban State Agency with the National Survey of Professional, Administrative, Technical, and Clerical Pay [February–March 1966]

Agency Position	Metro City[c,d]	Medium City[c]	Urban County[c]	State Agency[b]	National Survey[a]	
					Mean	Median
A. P. Engineer V				14 123	18 744	18 600
A. P. Engineer IV	10 175			12 205	15 876	15 900
A. P. Engineer III		8 000		10 543	11 844	11 700
A. P. Engineer II	8 900		7 620	8 848	9 828	9 768
A. P. Engineer I	7 900	6 600	6 600	7 584	7 752	7 752
Chemist III				10 042	13 860	13 788
Chemist II		7 900	7 380	7 858	9 216	9 060
Chemist I	6 000	6 000	6 360	6 788	7 140	7 200

Note: Certain positions of the agencies are not included (inspectors, meteorologists, educators, etc.) since there is no comparable national figure.

[a] These figures are from "Table 2—Average Salaries: Metropolitan Areas" in *National Survey of Professional, Administrative, Technical and Clerical Pay, February–March 1966.* (BLS Bulletin 1535) Washington, D. C.: U. S. Government Printing Office, 1966, 21. Metropolitan salaries are compared since air pollution tends to be a metropolitan problem. Job descriptions in the surveyed agencies were matched as closely as possible to descriptions in the national survey (pp 61–68).

[b] State salaries are the mid-range since other figures were not available.

[c] These are the mean salaries for the positions.

[d] Metro City salaries are to be increased by 8% starting in the next fiscal year.

Table IV Entrance Requirements for Positions in Four Air Pollution Control Agencies, 1967

Requirement	Metro City	Medium-City	Urban County	State Agency
Residence	Yes[a] (All)	Yes (All except agency head)	Yes	Yes (All except Engineer I)
Written examination	Yes	Yes[c]	Yes[c]	Yes[c]
Degree, prof. certificate or license	Yes[b]	Yes[b]	Yes[b]	Yes[b]

[a] Residence requirement waived only under unusual circumstances.

[b] Equivalent experience can be substituted for the requirement in certain cases.

[c] The requirement is not strictly enforced.

In each jurisdiction the main organization groups involved in personnel administration were the civil service board (in the urban county this was the Board of Commissioners), the chief executive's office, and the operating agency. Generally, recruiting, examining, certifying, placement, and hearing related appeals were vested in the civil service board except in Urban County. Metro City classification and compensation responsibilities were located in the executive office of administration. The final selection was usually the prerogative of the operating agency (in Medium-City the city council made the final selection). Recruiting, promoting, and rating performance were the immediate responsibilities of the operating agency.

In all the jurisdictions there is a trend toward decentralization of the personnel function. The civil service boards which had been previously the depository of the entire personnel function are giving up their responsibility for day-to-day administration. Since qualified persons are available in the operating agencies, decentralization of the personnel functions has been conducive to better personnel administration by putting the function where it can be handled most directly.[7]

Since it is the cornerstone of building a first rate staff, the importance of the recruiting program cannot be overemphasized and is strategic in this early stage of APC development. The recruiting effort in the four jurisdictions varied widely. Given the diversity of size and population of the jurisdictions, this variation was expected.

The recruiting activity of the medium-size city consisted of a few visits to colleges in the area and posting job-opening announcements. Official recruiting was done by the chief executive's office of administration. Informal, but sanctioned, recruiting was conducted by the control agency itself.

Even with limited needs, the recruiting effort of Medium City was sporadic, unplanned, and based on immediate needs. No attempt was made to estimate need, nor was continual contact kept with sources of manpower. The city was, however, in the process of evaluating its entire personnel program.

Metro City and Urban County both with full-time personnel agencies employed a variety of recruting techniques (field recruitment, distribution of pamphlets, spot radio announcements, and posted announcements). The operating agencies also took a part in recruiting which was informal and aimed toward filling specific positions.

The recruiting programs of the Metro City and Urban County were well conceived; needs were estimated and a wide variety of recruiting techniques were used. Nevertheless, they were failing to recruit the necessary personnel. Part of the reason was surely due to the national shortage; however, part of the failure was due to the inability of the agencies to offer adequate material benefits.

The state's recruiting program, relative to the others, was the most sophisticated. Personnel needs were forecasted by the agency; a wide variety of techniques were employed and continual contact was kept with sources of candidates. However, the state did have some trouble in filling all of its vacant positions; the inability to reimburse applicants for their expenses was a drawback and, although the state's salaries were higher than the local salaries, they still were not competitive in the labor market area.

Generalization about the adequacy of pay plans is risky, especially since the job descriptions used are based on broadly comparable definitions. There is the problem also of comparing regional salaries with national ones when it is obvious there are significant regional variations. It is evident, however, that the salaries paid for the personnel in the four agencies have not helped the acquisition or retaining of the manpower (Table III). Administrators in one agency readily admitted that there was a tendency for their engineers to leave for better paying positions in industry after they had acquired some experience.

Urban County fills a number of its positions with retired industry personnel. A few others, especially persons native to the area, have accepted positions with the county when faced with a transfer. There are, therefore, many dimensions to keeping talent—only one of which is monetary. The question is whether an expanding agency needing highly trained and scarce personnel can afford to have a weak spot in its attractiveness for employment.

The entrance requirements examined

10-4

in the four jurisdictions (recruitment, examination, and degree of certification), do not seem to be facilitating the process of getting qualified people (Table IV). In Metro City each applicant was forced to take an entrance examination, although degrees were specified for the position and some applicants had professional licenses.

Residency was generally required and there was strict application of the rule in every unit except the state. In Metro City there was practically no deviation from the rule. Since the variety of housing was quite different in the city when compared to the suburban area, this seems to be an especially important requirement. This is especially so when the scarcity and technical training of the needed persons are considered. In this era of extreme mobility of population and with the fragmentation of the local political units, for a jurisdiction to adopt a residence requirement is tantamount to getting along without the qualified person.

Based on these case studies there is no doubt that the personnel policies of a jurisdiction, as well as its compensation plan, can seriously affect the quantity and quality of an operating agency's manpower. Perhaps this is a predictable conclusion. From a cursory view of the literature on air pollution control, the concern for good personnel policies does not seem to be a major interest, although the lack of good personnel has been. The two are related. It is to be hoped that the call for research into training and manpower needs by the Air Quality Act of 1967 will result in further investigations into the effect of management practices on manpower shortages.

At a time when air pollution control agencies are gearing themselves for major efforts, the following needs to be strongly emphasized: The tasks of the leaders of air pollution control programs, both in and out of government, include efforts to promote good personnel programs and policies. If these air pollution control agencies are to be effective, they must have the high-quality personnel necessary for the job. Recruitment, classification, compensation plans, and the rest cannot be of high quality unless the public bodies responsible for setting the goals of personnel policy and the conditions of employment are conscious of the necessity for rational and workable personnel systems. Based on the findings in this paper such systems are not sufficiently developed.

Acknowledgments

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INTERLOCAL GOVERNMENTAL RELATIONS IN AIR POLLUTION ABATEMENT

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Introduction.-- An important aspect of urbanization concerns its impact on environmental resources. One issue of public significance falling into this category is the problem of air pollution. Much information pertaining to the origin, magnitude, and characteristics of this problem is readily available, but there exists uncertainty as to effective solutions for dealing with this widespread domestic challenge.

Local governments face various difficulties when contending with air pollution. A major obstacle results from the aerial dispersion of effluents over wide geographical areas. In most large urban areas, air pollution transcends local political boundaries, and the problem is beyond the competence of any one municipality. It becomes increasingly difficult for individual jurisdictions to undertake actions that are inevitably area-wide in scope. Individual efforts only deal with the problem on a piecemeal basis.

Statement of the Problem.--Organizational arrangements to integrate programs and provide common standards of service for metropolitan populations are needed at the local level. A proper relationship between form and function is required for the effective management and control of environmental resources, but appropriate governmental units for dealing with area-wide problems are often difficult to organize.[1]

The discipline of political science has been persistently concerned with the organization and administration of local government. Much has been written about the feasibility of various structural arrangements for achieving economic, efficient and effective governmental operations. Past prescriptions have called for the adoption of single, general units of government to encompass entire urban and metropolitan areas. The arguments state that since these places are socially and economically interdependent, they should be politically integrated. The existing fragmentation creates, it is asserted, inefficient administration, overlapping and duplication of governmental functions and an inability to formulate and execute area-wide policies.[2]

More recently some members of the discipline concerned with urban and metropolitan affairs have suggested that consensus on matters of area-wide importance can be achieved through the existing governmental framework by intergovernmental relations conducted among municipalities. In most metropolitan areas, there exist a variety of formal and informal arrangements to provide services. By negotiation on matters of mutual concern, agreements can be reached for undertaking integrative action.[3]

Interlocal Governmental Relations.--Techniques available to municipalities for surmounting jurisdictional and structural inadequacies can be distinguished as procedural or structural adaptations: the former are arrangements having slight effect on governmental structure, while the latter are more extemsove measures requiring the rodification of existing structures. Summarizing the classifications of several authorities, Roscoe C. Martin has compiled an inventory of sixteen techniques for integrating governmental activity. A table adapted from this listing is presented (Table I). The methods have been categorized as procedural and structural techniques.[4]

Following are short definitions of each of the interlocal arrangements listed in the table.

Table I.--Integrative Techniques for Local Governments

Interlocal Integrative Techniques	
Procedural	Structural
1. Voluntary Cooperation	1. Annexation
2. Service by Contract	2. City-county separation
3. Parallel Action	3. Geographical consolidation
4. The Conference of Governments	4. Functional consolidation
5. The Compact	5. The special district
6. Transfer of functions	6. The authority
7. Extraterritorial jurisdiction	7. Metropolitan government
8. Incorporation	8. The regional agency

Voluntary cooperation is a method of adaption through which municipalities agree on an informal basis to share or combine their efforts in providing common services e.g. exchanging information or sharing equipment.

Service by contract is a legal arrangement whereby one unit of government agrees, for a charge, to provide a service or group or services to another jurisdiction.

Parallel action is an agreement between municipalities to pursue similar actions with regard to a service within their own jurisdictions; a decision to engage in an activity is reached jointly, but each municipality takes independent action.

The Conference of Governments is an organization, consisting of key local officials or their representatives, that meets on a regular basis to discuss common problems, exchange information, and seek consensus on issues of mutual concern.

The Compact is a formal agreement between two or more units of government to meet common needs by undertaking reciprocal action.

The *Transfer of Functions* is a method of integration achieved by relegating activities from one governmental unit to another; generally, one with a larger territorial jurisdiction.

Extraterritorial Jurisdiction is a grant of authority by state enabling legislation given to a unit of government for undertaking various enterprises beyond its corporate boundary.

Incorporation is a procedure for designating a particular land area with a resident population as a distinct governmental unit with appropriate legal powers for providing services and regulating activity.

Annexation is a procedure used by a unit of government for increasing its territory by adding unincorporated land area or part of another governmental jurisdiction.

City-County Separation is a process of areal adjustment whereby a major city in a county detaches itself from the rest of this governmental unit to create a separate jurisdiction.

Geographical Consolidation is the joining together of two or more units of government into a single jurisdiction.

Functional Consolidation is a joint arrangement by municipalities for performing common activities and is usually effectuated by creating a new organizational unit.

A *Special District* is a separate unit of government established to perform some public service; its activities can be single function or multi-purpose.

The Authority is a unit of government similar to a special district in function and legal characteristics but differing in its financial capabilities, an authority is normally given the power to issue revenue bonds, whereas a special district tends to have taxing powers.

Metropolitan government is a method of drastically reorganizing local governmental jurisdictions by adopting a single, general unit of government for an entire metropolitan area.

A *Regional Agency* is an organizational unit established to provide comprehensive treatment for a problem or activity over an extensive land area that may extend beyond state borders.

Public Acceptance of Interlocal Integrative Techniques.-- A community attitude survey recently conducted in a small urban area was concerned in part with intergovernmental relations between municipalities. The study was undertaken to examine factors related to the political feasibility of certain governmental adjustments and to outline acceptable changes that could be made.[5]

Voters were asked to express their views about possible arrangements for providing municipal services. In a series of questions, the respondents were asked to choose the intergovernmental technique they preferred among paired items. In the ten questions used, they were to choose among five of the commonly used methods; consolidation, annexation, joint service, service provided by contract and voluntary cooperation (Table 2). The five methods were chosen to present a variety of techniques some of which would require major structural changes while others would require no structural changes at all.

The response varied by governmental jurisdiction. A priori, it was posited that the items represented a descending order of integration from consolidation to voluntary cooperation. On this basis, the township favored the strongest integrative measures followed closely by the city. The borough population, in every comparison but one, preferred the weakest association with the other units of government. Annexation, as a method of integration was rejected on all comparisons in each government area reflecting the northeastern dissaffection of this method except for minor readjustment of boundaries or rearrangements of relatively small parcels of land.

It is common practice that for any method requiring major structural changes by electoral process that there be a majority favoring the change in each governmental area affected. If we eliminate consideration of annexation, then only in the comparison of voluntary cooperation with joint action does this situation obtain a majority in all units.

Table 2.--Tabulation of Choices Between Interlocal Integrative Techniques in Three Local Governments, August 1967.

Which Would You Choose Between...?	City (N=235)	Township (N=114)	Borough (N=127)	Total
Service by contract	121	48	94	263
Annexation	103	31	26	160
Don't know	11	35	7	53
Voluntary cooperation	115	24	76	215
Joint action	107	48	45	200
Don't know	13	42	6	61
Annexation	67	23	30	120
Consolidation	149	58	81	288
Don't know	19	33	11	68
Joint action	124	40	41	205
Service by contract	99	30	77	206
Don't know	12	44	9	65
Voluntary cooperation	136	40	92	268
Joint action	87	32	26	145
Don't know	12	42	9	63
Service by contract	99	29	77	205
Consolidation	122	53	40	215
Don't know	14	32	10	56
Voluntary cooperation	106	27	63	196
Service by contract	118	40	56	214
Don't know	11	47	8	66
Voluntary cooperation	99	27	75	201
Consolidation	124	51	43	218
Don't know	12	36	9	57
Consolidation	122	46	37	205
Joint action	102	32	78	212
Don't know	11	36	12	59
Joint action	142	50	89	281
Annexation	83	25	27	135
Don't know	10	39	11	60

Question: "It does seem as if the local governments in this area are moving in the direction of having more and more contacts with each other. As far as these future relations are concerned, which intergovernmental methods would you prefer to see used?"

Although the number of possible choices were reduced, this survey shows that it is difficult to have strong integrative links accepted by a majority of the electorate in a number of different jurisdictions. In this case, the only agreement that could be reached was on the weakest sort of interlocal arrangement. It is not surprising, therefore, that when there is a pressing need for an area-wide solution to a problem that,if possible, the methods requiring no structural change are opted for by the responsible political leaders.

There are other important characteristics that enhance the choice of a method that does not require structural change. One is that, in general, methods that do not require structural changes do not require a referendum. For this reason some critics have levied the charge that these methods are essentially undemocratic for they remove from consideration by the electorate many decisions of importance. Second, because of the nature of the agreements, there is greater flexibility for the political leaders to enter into or drop out of these arrangements. For the same reason there is more opportunity for negotiation as experience develops with the service arrangement. For these reasons, and possibly others, agreements not requiring structural changes far outnumber the number of agreements requiring structural changes for providing services on an areawide basis at the local level of government.

Examples of Parallel Action in Local Air Pollution Control Programs.--A practical method for municipalities to provide services and deal with common problems is to cooperate with each other. Interaction of this type implies friendly, cordial relations along similar lines of action. Without losing their corporate identities municipalities can attain some degree of coordination in the performance of their designated activities. Functional integration achieved in this way has popular appeal because it is non-compulsory, and the governments may cooperate on one object or goal but not agree on others. Local officials and administrators decide in each instance the conditions under which they will agree to establish a mutual relationship.[6]

Parallel action is a form of interjurisdictional cooperation. By this method two or more governmental units can agree to combine their efforts in dealing with a common problem or providing a service. A joint decision is made for pursuing an activity, but each municipality takes independent action.

This method was used quite successfully to establish an interjurisdictional air pollution control program. A long range program of cooperation was undertaken to contend with an interminable problem faced in common by a number of municipalities. Similar air pollution ordinances were enacted by each of the participating communities, and a voluntary association was formed for administering the program within their respective jurisdictions. Initial action was instituted by two municipalities possessing a large number of major pollution sources but others subsequently entered the program. At the present time there are twelve cooperating municipalities, all boroughs and townships located in two counties, and there is a possibility of gaining a few more governmental units of the same type.

The program is a small scale operation with two full time employees, a director who is a professional engineer and a secretary to assist him.

The director, appointed as the chief air pollution control officer for each community, enforces the individual municipal ordinances. In carrying out the terms of the agreement, he has the responsibility of coping with technical problems and formulating a program of compliance. His activities are diverse and include on site inspecting of pollution producing equipment; inspecting and approving plans for installing, constructing, or altering equipment; permit certification for operating equipment; conducting air sampling procedures; investigating complaints; conducting particle analysis; participating in education and scientific activities related to air pollution technology; disseminating information to the public.

In each municipality there are citizen air pollution control boards, consisting of five members appointed by the elected representatives. They, along with the municipal officials, oversee the administration of the program within their own territory. Periodic meetings are held with the director to discuss progress that is being made and consider difficulties that arise from time to time. Independent action is taken within individual municipalities, and before the director pursues any major course of action, he confers with the municipal officials and the board members. Their consent is needed before enforcement procedures can be instituted. At times joint meetings of elected officers and board members are held between municipalities to evaluate matters pertinent to their common interests.

Public funds are allocated to finance the program. Service charges are levied on participating governments according to an established formula, based on population, assessed valuation, and the number of major industrial plants.

Two criteria can be used for evaluating the effectiveness of this program. The first is the expenditures of major offending industrial plants for dust control equipment, and the second is the amount of dustfall in the communities in the area. Since the program began,the principal industrial plants have expended 20 million dollars for air pollution control equipment. Before this phase of the program can be judged complete, expenditures of approximately 25 million dollars will be made. According to the second factor, surveys have indicated a steady decline in the annual dustfall within the areal jurisdiction of the program. When air pollution control was first instituted, there was an average yearly dustfall of approximately 3,600 tons/sq. mi/mo., but the dustfall rate now occurring has been reduced to approximately 600 tons/sq. mi/mo.

A significant feature of this association is the close mutual relationship existing between all phases of the program operation. Interaction between members of the communities, their elected representatives, the offending pollutors, and the air pollution control officer establishes an environment for seeking realistic solutions to the problem at hand. The views of all affected persons are able to be presented. Through conciliation and persuasion, decisions can be made that take into consideration the particular circumstances within the local jurisdictions. Ultimate control of the program rests with the persons residing in the areas where the problem exists.

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Another interjurisdictional air pollution control program recently instituted was established by parallel action and functional consolidation. It was created by a joint agreement entered into by seven municipalities: one city, two boroughs, and four townships. All are located within a single county.

The communities were faced with a number of diverse pollution problems, consisting mostly of dust from industrial activity. Specific circumstances varied within jurisdictions, each one possessing particular problems, with one having no industrial sources of its own. Relief from persistent air pollution nuisances was desired by various interested persons and groups in the area. The parties felt that some form of cooperative action was necessary to effectively reduce or abate the various problems. This was needed to insure that major pollution sources would be included within a comprehensive control program.

When a decision was reached to undertake joint action in controlling air pollution, the participating municipalities enacted similar ordinances. The sturcture of this organization differs from the one previously discussed. Instead of separate air pollution control boards for each of the local governmental units, a single body was created to serve the entire area involved in the program. Appointments are made by the principal executive officials of the participating municipalities. One member is designated by each governmental jurisdiction except for the city, the largest unit in population which selects two members. Board members serve three year terms. Initially these were staggered, with two appointed for one year, three for two years, and three for three years. Appointees are required to possess specific qualifications. At least two must be registered engineers. A minimum of two are required to be persons engaged in the operation and management of manufacturing or industrial plants, and there must be at least one chemist and one physician appointed. A board chairman is elected from among the members.

The board acts in a general advisory and supervisory capacity, overseeing the administration of the program and enforcement of the ordinances. Monthly meetings are held, at which time general activities and finances are reviewed and new business is considered. Whenever the need arises, public hearings are held for adopting and promulgating rules and regulations. Any order or decree that is issued can be appealed to the board for review. Members of the board ultimately are responsible to the jurisdictions they represent, and they are required to report to the elected officials of these governments.

A director is employed by the board to administer the program and enforce the provisions of the ordinances. At the present time he is assisted by a full-time secretary, but other personnel can be hired if needed. The director is required to possess technical training and experience in the theory and practice of air pollution control processes. This includes knowledge about the design, construction, and operation of fuel-burning equipment, along with a familiarity of industrial and commercial processes causing air pollution.

In addition, provision is made for an advisory board, which is in the process of being formed. Each governmental unit has one member, selected from among its elected officials. The purpose of the board is to outline procedures to follow when an emergency air pollution situation arises.

Costs for the program are shared by the participating governments. Funds for each jurisdiction are derived by a formula based on the following factors: population, assessed value of real estate, and number of employees engaged in manufacturing. Each government pays a percentage of the program expenses.

The program was instituted in January 1966, when a director assumed the duties of the position. His initial efforts were concerned with formulating a general outline of problems existing within the communities. An air monitoring program was instituted to measure pollution levels, and specific offenders were alerted to the fact that they were not in compliance with the standards set in the municipal ordinances. Emphasis of the program has been directed toward establishing specific air pollution goals and devising solutions that are feasible.

Summary and Conclusions.--Urban and metropolitan areas have emerged as an important form of social organization in the modern industrial society of the twentieth century. A number of contervailing forces have operated to produce a type of "regional community", which is united by various networks of human influence and areas of common interest but separated by territorially distinct political jurisdictions.7

With increased industrialization and population growth, local communities must contend with numerous complex problems. In many instances solutions only can be fashioned by the cooperative efforts of municipalities directed toward a common goal. The methods available for meeting these needs are conditioned by certain indigenous factors that prevail within a particular community setting. As one political scientist has stated, "...metropolitan solutions are a function of time and place, of local traditions and values, of political, social, and economic environment, and of statutory and constitutional setting".[8]

The type of arrangements that can be pursued are determined by state legal codes and constitutional provisions. Local governments are creatures of the state and can perform only those activities which are designated to be within their authority. Within this context, the type or relations that can be conducted among municipalities are specified by statute. Ultimately, the acceptance of any proposal that requires structural changes rests upon the approval of the residents in the affected communities, and this consent is based upon the benefits to be received and the concessions to be made by adopting a particular arrangement.

Politics, as one person has defined the term, is the process of deciding who gets "what", "how", "when", "where", and "why". Essentially the object of politics is the resolution of conflict over public policy. Consensus reached through political interaction establishes a framework for governmental activity. In metropolitan areas, agreement about matters of mutual concern is essential for pursuing a common course of action. Achieving this is not so much a factor of the number of separate jurisdictions that exist but of the mechanisms available for making decisions in regard to pertinent issues. Intergovernmental relations conducted between municipalities can provide a basis for concurring on matters of area-wide importance and outlining ways to treat them.[9]

Contrary to predictions that have been made, the system of fragmented local government has not resulted in catastrophe. Existing governmental arrangements may be awkward, but they have been able to operate without causing a general breakdown in the functioning of urban and metropolitan communities. By various methods, essential public services are able to be provided by some agency of government; mechanisms have been fashioned for overcoming anachronistic political boundaries.[10]

Efforts for adaption are usually stimulated when there is a lack or deficiency of some service; a function may be performed inadequately, conducted inefficiently by a given level of government, or may not have been accepted as a responsibility of government. An underlying basis for such action is the awareness by a significant part of a population that a need or problem exists, and remedies are usually fashioned by the relevant parties affected by a particular problem.[11]

The examples in this paper demonstrate that small local governments are capable of responding to urgent needs. The methods used in these cases are indicative of the arrangements that are within the grasp of most urban communities faced with common problems. On an incremental, ad hoc basis, local governments can devise ways of coping with problems that are beyond their individual capabilities.

The acceptance of a particular method depends upon several factors. Among these considerations are: (1) the characteristics of the problem, (2) legal restrictions, and (3) perceived effects of a particular technique.[12] A necessary requirement for air pollution abatement is to establish an organizational unit that encompasses the major pollution sources within a particular area. Effective administration of an air pollution control program requires the management of a number of elements, and this control can only be achieved when all of the factors affecting the quality of the environment are able to be coordinated. One observer has the following to say about existing governmental patterns in metropolitan areas:

> "To the extent that they take each other into account in competitive relationships, enter into various contractual and cooperative undertakings or have recourse to central mechanisms to resolve conflicts, the various political jurisdictions in a metropolitan area may function in a coherent manner with consistent and predictable patterns of interacting behavior. To the extent that this is so, they may be said to function as a 'system'.[13]

A final or absolute solution to government in metropolitan areas is difficult to conceive. Comprehensive institutional realignment culminating in the establishment of general units of government encompasing entire metropolitan areas appears to be a remote possibility. In lieu of an extensive restructuring of governmental organizations, there is stimulation to work through the existing governmental framework to develop methods for coping with functional problems.[14]

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On Measuring the Acceptability of the Integration of Local Governments

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Intergovernmental relations, a many sided phenomenon, has been viewed from many standpoints. Of concern here is but one part of this general field, mainly interlocal relations, the relations of local governments with each other.[1]

In early studies, such as Studenski's of the New York metropolitan area, the author examined the experiences of cities throughout the world to get examples of consolidation, annexation, functional consolidation, and other methods of governmental integration.[2] More recently, perhaps as the result of the practical function of many of the newer studies, and because of the wider use of many of these governmental devices in all metropolitan areas; the examples of local experiences with the various forms are drawn from the local area or, at least, from the United States. The most important exception to this rule is the frequent inclusion of metropolitan Toronto in most of the studies.

An important innovation in the discussion of local intergovernmental relations was the differentiation of the governmental devices by Victor Jones in 1942 into those that required structural changes in the existing governments and those devices that did not.[3]

The early studies often included statements on the author's preference for a particular mechanism and statements, to the effect, that if something was not done in the near future the metro area governments, especially those of the central cities, would collapse. These statements ended, at least in the political science literature, after the brilliant exposition of the fallacy of early arguments by Robert Wood. Wood, however, called for a consolidation of governments on moral grounds. The one governmental structure for the whole metropolitan area was needed to determine questions on the allocation of resources for the area.[4]

There have been at least two different kinds of dissents from the view as exemplified by Wood's statement. One is an attack on the assumption that members of the different geographical areas are not members of the same political system. Ostrom, Warren, and Tiebout attempted a theoretical demonstration that an informal system of government exists for the metropolitan area. Their exposition includes several examples where nonintegration of areas led to a greater degree of flexibility in planning and a greater variety of services provided.[5]

The second dissent is a result of the attempt to explain why there is so little integration of metropolitan areas. The reasons given by Williams, et.al., is that the differentiation of sub-areas in a metropolitan region is the result of rational decisions, for the most part, of the people to match their desires of the kind and level of service, of life style, with income.[6]

It is concerning the explanation of why there is no greater integration of local governments that this paper is aimed. Using Martin's classificatory scheme there are 16 different methods available to persons who wish to provide services on an areawide basis.[7] The possible number of permuted rankings of 16 things is 16!, a large number. It is reasonable to assume that given so many rankings there would be great variety in the rank preferences for the device of local government integration in any given geographical area.

It is the purpose of this paper to describe a method by which the amount of disagreement among groups in a metropolitan area may be measured. A second purpose is to give an additional explanation of why strong metropolitan integrative methods are not used by demonstration of the measurement of disagreement in one small urban area.

In the summer of 1967, a survey of the electorate of three small governments in central Pennsylvania was conducted. This survey in part was one directed at opinions on the methods of intergovernmental relations that were used in this local area. Accordingly, a survey of the local governmental officials' attitude of these relationships was completed. In addition, a survey of the population included a series of questions comparing five of the devices used in intergovernmental relations. These were consolidation, annexation, joint service, service provided by contract and voluntary cooperation. As the result of the interview survey there were 476 usable questionnaires.

According to a procedure outlined by Kemeney and Snell in Mathematical Models in the Social Sciences each of the intergovernmental methods were paired against each other in a series of questions. For example, "Which do you prefer--consolidation or voluntary cooperation?" As a result of this series of questions a matrix of the answers of each individual to all of the ten questions was constructed. Given that the representation of one individual's response to all ten questions can be represented by a matrix labeled A, then $A = (a_{ij})$, where $i, j = 1, 2, 3, \ldots, n$.

Then a_{ij} = = 1 if i is preferred to j
= -1 if j is preferred to i
= 0 if they are tied

A number of conditions are specified if the matrices are to have the appropriate properties as "ordering matrices." These are:

(1) $a_{ij} = +1, 0 \text{ or } -1$

(2) $a_{ij} = -aji$

(3) If $aij \geq 0$ and $ajk \geq 0$, then $aik \geq 0$; and
$aik = 0$ only if both the others are 0.[8]

In this paper the ordering of choices from consolidation, annexation, joint service by contract, service provided by contract and voluntary cooperation is considered that order from most integrative to least integrative. A response matrix agreeing with this natural order, is represented by A in figure 1 and is the canonical form. A person who consistently ranked the less integrative method as being preferable has a response set like B in figure 1. An example of one who was in accord with the theoretical order with the exception of one method, say annexation, would look like C in figure 1. Finally, the response set of one who could not choose between any of the alternatives would look like D in table 1.

Given two ordering matrices A. and B, according to the criteria by which the ordering matrices have been constructed, there is a unique distance function $d(A,B) = 1/2\ \Sigma|a_{ij}-b_{ij}|$. The resulting distance is determined in the following manner. In comparing the elements in each of the matrices A and B, for each element that are identical we write a 0, for each that are different we assign a 2, if one gives a preference when the other denotes a tie, we write a one. The sum of the difference of each of the elements in the two matrices is the distance d(A,B). For a consensus ranking of the agreement of n persons the median is that set of points for which $\sum_{i=1}^{n} d\ (A_1,B)$

is minimum; the mean is that point for which $\sum_{i=1}^{n} d(A_i,B)^2$ is a minimum.[9]

Using the procedures outlined above a consensus ranking was obtained from the respondents in each of the political jurisdictions and for the total study area. These are reproduced in Table 2. It can be seen that there is great disagreement in the study area about the means to provide areawide services.

A visual analysis of the response sets does show, however, that within each of the subareas there are tendencies to prefer certain interlocal methods of providing services. Surprisingly, the township residents are most strongly in favor of consolidation, and , in general, they tend to be in greater agreement with assumed natural order rankings of the survey. They are closely followed by the residents of the city.

Annexation as an integrative method is rejected in each of the subareas. In the individual responses, it is favorably mentioned the least number of times never attaining a majority of favorable response regardless of the alternative interlocal method to which it is being compared.

It is the residents of the small town contiguous to the city who are in greatest disagreement with the others. Again from inspection it seems that they would favor most highly the provision of areawide services by voluntary cooperation. It is interesting to note that they also would prefer consolidation to annexation. It would seem that in the northeastern United States, for historical and practical reasons, annexation is not an accepted method of integration of local functions.

Measurement of the agreement cn the modes of interlocal cooperation adds a new dimension to the discussion of interlocal relations, Most of the previous research has documented that substantial integration of governments cr governmental services has been delayed because of the fear of the loss of local identity, of the loss of access to the policital machinery or of the loss of life style.[10]

Certainly, all of these are responsible for the lack of integration of local governments. Studies of these underlying reasons are perhaps more important and more interesting than study of the agreement on the methods of integration. In fact, the two are difficult to separate since, for example, methods not requiring structural change will allow the provision of the areawide service without greatly affecting, say, life style.

It is important, however, to realize that there is little agreement on the methods of providing areawide services since in any particular case the method of providing the service on an areawide basis is proposed shortly after the need for the service is identified. This may be related to the fact that in a number of instances agreement is reached on the need for the service, but the issue flounders on the method to be used to provide the service.

Political scientists, who have argued the merits of areawide governments, have so refined the items of discussion that they may not realize that the public's knowledge is not high. There is a tendency to think of the opinions on these matters to be grouped in a small number of categories, complete integration, mixed and fractionated. From the results of this survey the general population cannot be classed in a small number of categories without endangering the conclusion to be drawn from the results. It would seem that the issue is multidimensional and not undimensional and proceeding in one direction along the continium from consolidation to voluntary cooperation does not necessarily lead to an increase (decrease) in the number of people favoring the particular approach.

Table 1. Examples of Ordering Matrices,[a] [b]

A. According to Theory
Canonical Form

	C	A	JS	SC	VC
C	0	+1	1	1	1
A	-1	0	1	1	1
JS	-1	-1	0	1	1
SC	-1	-1	-1	0	1
VC	-1	-1	-1	-1	0

B. Prefers Least
Integrative Mehtod

	C	A	JS	SC	VC
C	0	-1	-1	-1	-1
A	+1	0	-1	-1	-1
JS	+1	+1	0	-1	-1
SC	+1	+1	+1	0	-1
VC	+1	+1	+1	+1	0

C. According to Theory
Except for Annexation

	C	A	JS	SC	VC
C	0	1	1	1	1
A	-1	0	-1	-1	-1
JS	-1	+1	0	1	1
SC	-1	+1	-1	0	1
VC	-1	+1	-1	-1	0

D. Unable to Choose
Between andy Alternative

	C	A	JS	SC	VC
C	0	0	0	0	0
A	0	0	0	0	0
JS	0	0	0	0	0
SC	0	0	0	0	0
VC	0	0	0	0	0

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[a] A positive sign indicates that the respondent prefered the row choice to the column choice, a negative sign that he prefered the column choice to the row choice; and a 0 signifies that the respondent could not choose between the paired items.

[b] C = Consolidation; A = annexation; JS = joint service; SC = service by contract; and, VC = voluntary cooperation.

Table 2. Attitude Matrix "B", the Least Error Matrix, from the Three Governments and the Total Area.[a] [b]

A. Borough

	C	A	JS	SC	VC
C	0	1	-1	-1	-1
A	-1	0	-1	-1	-1
JS	1	1	0	-1	-1
SC	1	1	1	0	-1
VC	1	1	1	1	0

B. City

	C	A	JS	SC	VC
C	0	1	1	1	1
A	-1	0	-1	-1	-1
JS	-1	1	0	1	-1
SC	-1	1	-1	0	1
VC	-1	1	1	-1	0

C. Township

	C	A	JS	SC	VC
C	0	1	1	1	1
A	-1	0	-1	-1	-1
JS	-1	1	0	1	1
SC	-1	1	-1	0	1
VC	-1	1	-1	1	0

D. Total Area

	C	A	JS	SC	VC
C	0	1	1	1	1
A	-1	0	-1	-1	-1
JS	-1	1	0	-1	-1
SC	-1	1	1	0	1
VC	-1	1	1	-1	0

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[a] (same as Table 1)

[b] (same as Table 1)

NOTES

1. See, further definition, W. Brooke Graves, "Interlocal Relations" in *American Intergovernmental Relations* (New York: Charles Scribner's Sons, 1964), 737-799; John E. Stoner, "Cooperation Among Units of Government," in U.S. Department of Agriculture, *Agricultural Year Book: 1963* (Washington, D.C.: Government Printing Service, n.d.), 278-284; and, John E. Stoner, *Interlocal Governmental Cooperation* (Washington, D.C.: Economic Research Service, 1967)
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